



FactoryTalk Metrics User Guide

Version 14.00.00



User Manual

Original Instructions

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Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT: Identifies information that is critical for successful application and understanding of the product.

These labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.



Tip: Identifies information that is useful and can help to make a process easier to do or easier to understand.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

Welcome to FactoryTalk Metrics

In this chapter, you will learn about the following:

- [Introduction on page 7](#)
- [Features and benefits on page 7](#)
- [Intended audience on page 7](#)
- [Product support on page 8](#)

Introduction

Companies in the discrete and repetitive manufacturing industries are being challenged by management to maximize production from existing lines, to meet required cycle times and delivery dates for each product, and to reduce costs. To meet this challenge, production management is striving to operate the equipment at its highest efficiency.

Real-time identification of production assets that fail to reach the required standard is critical to maintaining world-class efficiency. A thorough understanding of the details behind production performance will allow you to identify sources of production inefficiencies, and to maximize asset utilization.

FactoryTalk® Metrics provides ratings - Overall Equipment Effectiveness (OEE), Mean Time Between Failure (MTBF), and Mean Time to Repair (MTTR) - that allow you to evaluate the performance of your production assets. A production asset (or activity area) can be anything from a single piece of equipment to a complete manufacturing plant. These ratings provide a simple way to determine quickly whether a production asset is performing adequately, based on data collected from the control system.

Features and benefits

FactoryTalk Metrics offers the following features and benefits:

- Rich querying and analysis capabilities providing a complete and easy-to-use solution for performance analysis.
- High-level analysis tools to identify poorly performing assets easily, including the ability to drill into the underlying detail to identify the causes of production inefficiencies.
- The ability to evaluate every production asset based on OEE, MTBF, and MTTR ratings.
- The ability to isolate each asset so that its rating is not affected by upstream or downstream performance.
- The ability to connect most of the OEE parameters to either a data point or a formula, providing flexibility in the configuration of the OEE rating.

Intended audience

The *FactoryTalk Metrics User Guide* is designed to help you understand how to access and use the FactoryTalk Metrics product. This document focuses on the end-user functions of FactoryTalk Metrics and does not cover the installation and operation of underlying system services.

This document is intended for the following user of the RSBizWare™ software:

- **RSBizWare administrators**
RSBizWare administrators configure the RSBizWare system so that it can capture performance data for use by report designers and report users.

They should be familiar with:

- Control systems, process information (line and plant), and databases.
- Microsoft Windows operating system.
- The location and structure of databases.

Product support

Consult the following resources for additional information about the product:

- **Release Notes**
The release notes contain current information about the product, including hardware and software requirements, new features, known and fixed anomalies.
- **FactoryTalk Metrics Administration Guide**
The administration guide helps the RSBizWare administrator install and configure the software as well as understand the architecture of the RSBizWare suite and its components.
- **FactoryTalk® Report Expert Users Guide**
FactoryTalk Report Expert is a component of FactoryTalk Metrics. The *Report Expert Users Guide* is designed to help the users understand how to install, configure, access, use, and maintain your Report Expert software.
- **Online help**
The online help provides general information and step-by-step procedures for working with the product.
- **Rockwell Automation Support Center**
The support center provides a variety of services, such as trainings, webinars, and online support that will improve your experience using the RSBizWare suite.

Get web support

For web-based product support, and for detailed information on technical support resources, visit the support site.

Access the Rockwell Automation Knowledge base for 24/7 technical information and assistance. You can also download software patches and new software versions, ask questions via email, participate in user forums, and access other useful problem-solving tools.

The support resources available vary, depending on the product purchased. The latest information can be obtained from the [Rockwell Automation Technical Support](#) website.

A current TechConnect Support contract may be required to use some online features.

Get phone support

To speak with a Technical Support representative in North America, call 1-440-646-3434.

For information on how to contact Technical Support in other locations worldwide, visit the support site.

A current TechConnect Support contract may be required to obtain phone support.

Get consulting services

Rockwell Automation provides expert consulting and turnkey implementation of this product. Contact your local representative for more information.

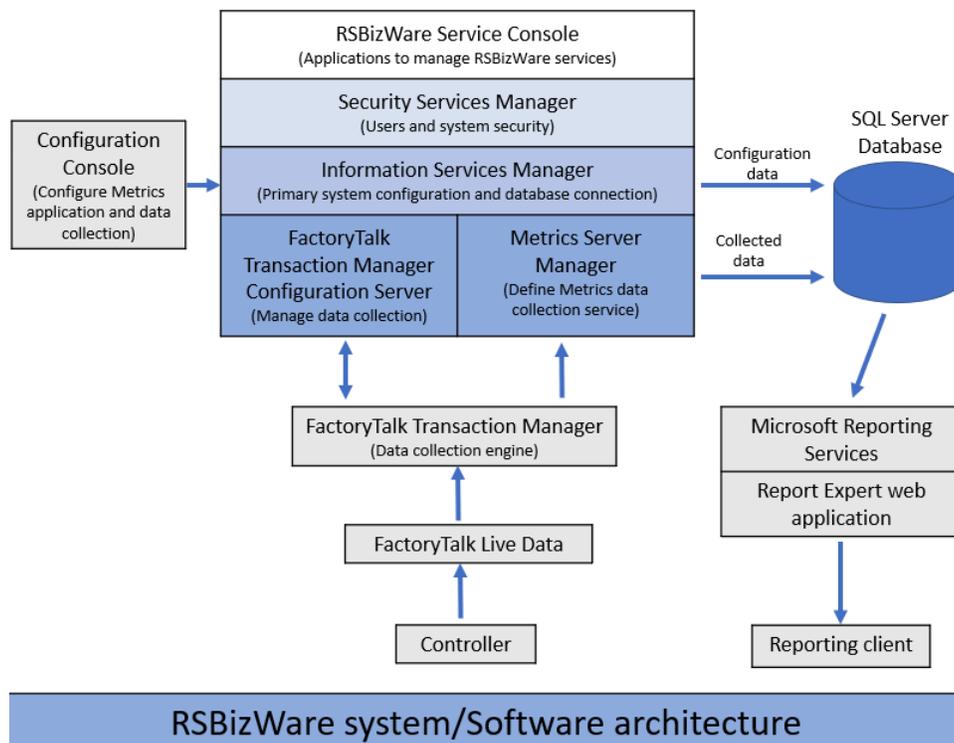
Contact us

We strive to help all of our customers become successful in their manufacturing improvement efforts. Toward this objective, we invite you to contact your local representative or Rockwell Automation at any time that we may be of service to you.

Getting started

Before you walk through the examples and tutorials that are discussed in this book, it is assumed that the RSBizWare administrator has installed, configured, and started the RSBizWare server on the server computer.

The software architecture



The RSBizWare architecture is a scalable, multi-tiered, distributed architecture consisting of a data collection subsystem, a SQL Server database repository, the Information Services Manager, and clients. Rockwell Automation's FactoryTalk[®] Transaction Manager is the embedded engine that collects data from the control systems, and the Metrics Server Manager logs it to the predefined RSBizWare database repository. The Configuration Console is the client.

The RSBizWare architecture can be configured to run on a single computer, or it can be distributed across multiple computers. In the simplest case, the Configuration Console, the Information Services Manager, the RSBizWare administrative tools used by the RSBizWare administrator, the database, the Metrics Server Manager, and the FactoryTalk Transaction Manager data collection engine run on a single computer. In a distributed setting, these components may reside on separate computers. Clients connect to the Information Services Manager using TCP/IP, so they can be deployed over a LAN, WAN, intranet, or the Internet. The scalability of the RSBizWare architecture allows many clients to connect to a single server.

Reporting options

There are several options available for reporting on data collected by FactoryTalk Metrics.

1. Report Expert reports.
Report Expert is a reporting system designed for use with FactoryTalk Metrics data only. It uses SQL Server Reporting Services and IIS. It is described in the *Report Expert Users Guide*.

2. Other reporting systems.

FactoryTalk Metrics has a documented database schema and an API library, so FactoryTalk Metrics data can be reported on by other reporting tools, either from Rockwell Automation or from other vendors. These are not described in this manual.

The Information Services Manager

If you wish to configure your plant model, manage the collection of control system data, you should connect to the Information Services Manager via the Configuration Console. Your RSBizWare administrator must assign a FactoryTalk Metrics Author license and the appropriate privileges to you, to enable you to perform these functions.

To start the Configuration Console:

1. Go to **Start > All Programs > Rockwell Software > RSBizWare > Configuration Console**.

The **RSBizWare Login** dialog box appears.

2. If prompted, type the username and password for the account that your RSBizWare administrator has authorized for you, type the name of the server computer where the Information Services Manager is running in the **Server** box, and then click **Login**.

A client session with the RSBizWare server is established.

The status bar at the bottom of the client application shows your username, the activations that have been assigned to you, and the Information Services Manager to which you are connected.

admin FactoryTalk Metrics Author rockwell-keith

The plant model

The plant model is made up of activity areas - enterprises, sites, areas, lines, and workcells - as well as of equipment and labor resources. The activity areas are based on the terms defined by the Instrument Society of America (ISA) S95 standard in order to provide common terminology for improved communication and integration between control systems and enterprise systems.

Item:	Description
Workcell	A location and/or group of equipment used to perform work in a manufacturing process. The operations in a manufacturing process are performed at workcells. A workcell is typically a physical location and a primary resource (for example, a machine); however, it may also represent a logical grouping of primary resources from which a selection is made.
Line	A collection of one or more workcells that are combined to perform the work. The workcells in a line are either physically located close to one another, or are related to one another in the production process (the production result of the first workcell in a line feeds the second workcell in the line).
Area	A physical, geographical, or logical grouping of lines and/or workcells within a site, typically representing a main production capability (for example, electronic assembly) within a manufacturing location.

Item:	Description
Site	A group of areas, lines, and workcells representing a geographical location at which products are manufactured.
Enterprise	The highest-level activity area, typically representing the business.

The enterprises, sites, areas, lines, and workcells in your plant model are the subjects of your performance parameter evaluation. For implementations of RSBizWare that incorporate the FactoryTalk Scheduler application, the plant model also includes capacity, which is the property of an activity area describing its availability over time. The performance parameters can also be configured for resources.

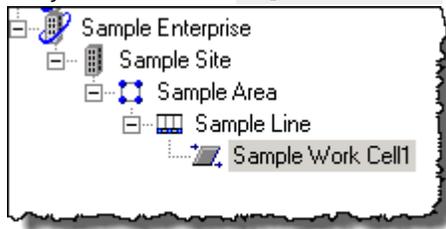
Configure the plant model

To create and edit the plant model, you must be granted the Organize plant model privilege by your RSBizWare administrator.

If you want to have access to sample data, see [Load sample activity areas on page 13](#).

To configure the plant model in the Configuration Console:

- On the **Configure** menu, click **Plant Model**.
The **Plant Model** dialog box appears.
- Right-click in the area under the plant model tree, and then click **New Root Enterprise**.
A new enterprise is added to the tree.
- Change the default name to `Sample Enterprise`, and then press Enter.
- Right-click **Sample Enterprise**, and then click **New Activity Area > Site**.
A new site is added to the tree.
- Change the default name to `Sample Site`.
- Right-click **Sample Site**, and then click **New Activity Area > Area**.
A new area is added to the tree.
- Change the default name to `Sample Area`.
- Right-click **Sample Area**, and then click **New Activity Area > Line**.
A new line is added to the tree.
- Change the default name to `Sample Line`.
- Right-click **Sample Line**, and then click **New Activity Area > Work Cell**.
A new workcell is added to the tree.
- Change the default name to `Sample Work Cell 1`.



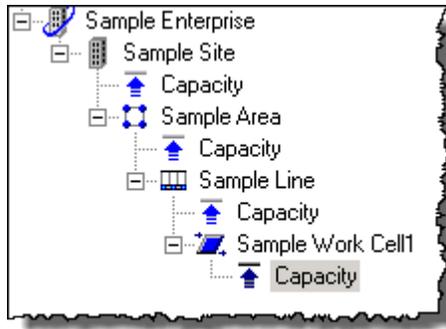
- Right-click each activity area that you have created, and then click **Add Capacity**.



Tip: The capacity of an activity area describes its availability over time.



Add capacity for your activity areas so that you can associate them with time patterns.



13. Click **OK**.

Load sample activity areas

Follow these steps on the Metrics server computer. For more information, see the *FactoryTalk Metrics Administration Guide*, section Clean installation: supported installation scenarios.

If you are ready to configure your own application, you don't need to load the sample data.

To load FactoryTalk Metrics sample data:

1. Go to **Start > All Programs > Rockwell Software > FactoryTalk Tools > Database Wizard**.
The **Database Load and Update** wizard appears.
2. On the **Welcome** page, click **Next**.
3. On the **Product and Database Connection** page, provide the following information:

Item:	Description
ODBC DSN	Select the name of the ODBC data source that you have configured for your RSBizWare SQL Server database.
User	Type the username of your RSBizWare database.
Password	Type the password for the RSBizWare database user.

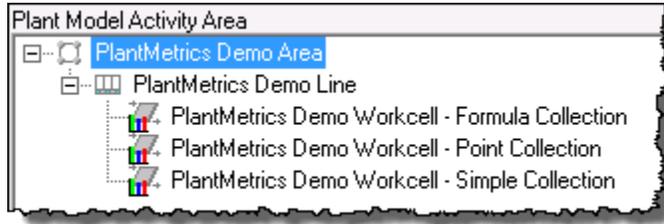
4. Click **Connect**. The **Available Product Modules** list is populated with FactoryTalk® components.
5. Under **Available Product Modules**, select **FactoryTalk Metrics examples** and **Report Expert**.



Tip: Select both options so that you have access to FactoryTalk Metrics and Report Expert sample data.

6. Click **Finish** to load data.
7. Click **Close** to exit the wizard.

Now you can examine the OEE performance parameters that are configured for sample activity areas. The activity areas are listed in the **Manage Performance Parameters** dialog box, under **PlantMetrics Demo Area**.



Tip: To open the Manage Performance Parameters dialog box, on the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.

Performance data

The primary functions of FactoryTalk Metrics are collecting and analyzing production data to provide performance ratings for every activity area. Before analyzing the data, the RSBizWare administrator must set up the application to collect data from the control system.

This chapter will help you understand the two key categories of ratings used to evaluate the performance of a production asset, and understand how to identify and configure the data points that will be used to collect the production data necessary to calculate performance ratings.

We will:

- Define the OEE and Fault Metrics ratings.
- Configure the FactoryTalk Metrics application, including plant model configuration, time pattern configuration, time pattern exception configuration, composite time pattern configuration, and performance parameter configuration.
- Start and stop data collection.
- Perform manual data collection.

Part count data

In version 7.0 of FactoryTalk Metrics, a change was made to the way that the data collection is initialized. Before this, it was possible to have partial FactoryTalk Transaction Manager .rsl files (still stored on disk when data collection started) processed as current data values. This approach could lead to inaccurate count information being recorded if a part count reset in the control system. The most serious effect of this issue was observed when the counter used in a FactoryTalk Metrics part count formula was reset, and the resulting formula evaluated to a negative number. The change required that the initial data used as a baseline for calculations all come from the same time period. In certain environments with continuous counters that do not get reset, this change could result in the loss of count data that was collected erroneously in previous versions. The data collected this way can account for the part counts that were produced since the last time the Metrics server was running.

In order to accommodate customers that found this data useful, the Metrics Server Manager settings file (**PlantMetricsServerSettings.xml**) can be configured so that it forces the Metrics Server Manager to initialize its data in the pre-7.0 manner.

The file is in the **<ProgramFiles>\Rockwell Software\RSBizWare** folder. It contains the `InitializeFromSingleTimestamp` tag. The tag is set by default to `1`. The default value causes the Metrics Server Manager to process data in the standard way to help prevent the inclusion of older data. If you change the value to `0`, the Metrics Server Manager will process data regardless of its timestamp. This change may be appropriate for some production environments, but in others may lead to incorrect values being logged for count information.

For more information on the Metrics Server Manager settings file, refer to The Metrics Server Manager settings file in the *FactoryTalk Metrics Administration Guide*, section Administer RSBizWare servers: The Metrics Server Manager settings file

OEE rating

FactoryTalk Metrics uses the OEE (Overall Equipment Effectiveness) model to measure the performance of manufacturing equipment. The OEE model yields a single performance rating for every activity area (workcell, line,

area, or plant) being monitored, thereby providing a simple way to determine quickly if an activity area is performing adequately. The OEE value can be used to assess a single machine's performance over time, or to compare the performance of machines.

Three components contribute to the OEE value:

- **Availability**

The ratio of running time to available time.

Available time may be defined by a schedule, or modified by planned downtime events such as preventive maintenance. Available time may also be modified by events such as being starved for parts or being blocked by a downstream process.

$$\text{Availability} = \text{RunningTime} / \text{AvailableTime}$$

- **Throughput**

The performance of a machine when it is running compared to its ideal cycle time.

The ideal cycle time depends upon the product being produced, and is measured in units of seconds per part.

$$\text{Throughput} = (\text{TotalParts} \times \text{IdealCycleTime}) / \text{RunningTime}$$

- **Quality**

The percentage of good parts that are produced.

$$\text{GoodParts} = \text{TotalParts} - \text{Scrap}$$

$$\text{Quality} = \text{GoodParts} / \text{TotalParts}$$

The OEE calculation that is used by FactoryTalk Metrics is the product of these three components:

$$\text{OEE} = \text{Availability} \times \text{Throughput} \times \text{Quality}$$

$$\text{OEE} = \frac{\text{RunningTime}}{\text{AvailableTime}} \times \frac{\text{TotalParts} \times \text{IdealCycleTime}}{\text{RunningTime}} \times \frac{\text{GoodParts}}{\text{TotalParts}}$$

This reduces to:

$$\text{OEE} = \frac{\text{IdealCycleTime} \times \text{GoodParts}}{\text{AvailableTime}}$$

FactoryTalk Metrics gathers and stores all of the raw data necessary to make this calculation for specific time periods, as well as by activity area, by part number, and by shift. All of the individual components of the calculation are stored and available for analysis.

OEE is a valuable method of analyzing performance, because it is widely recognized and can be applied to any type of industry, factory, or machine. However, it is merely the default efficiency calculation performed by FactoryTalk Metrics, and additional or alternate calculations can be implemented. Furthermore, FactoryTalk Metrics supports the collection of detailed event data, which can be used to analyze the specific causes of inefficiencies.

Fault Metrics ratings

FactoryTalk Metrics uses the Fault Metrics ratings to measure the reliability of manufacturing equipment. These metrics provide a simple way to determine quickly if an activity area is performing reliably. The Fault Metrics values can be used to assess a single machine's reliability over time, or to compare the reliability of machines to each other.

Mean Time Between Failure

$$\text{MTBF} = \text{Uptime} / \text{FaultCount}$$

Mean Time Between Failure (MTBF) is the ratio of running time to the total number of failures. It measures the average amount of time when a piece of equipment was in a running state between failures. MTBF is a derived field that contains aggregate functions and, as such, can only be used in summary report objects and cannot have aggregate functions applied.

Mean Time to Repair

$$\text{MTTR} = \text{FaultTime} / \text{FaultCount}$$

Mean Time to Repair (MTTR) is the ratio of the time spent in a failure state to the total number of failures. It measures the average amount of time when a piece of equipment was in a failure state. MTTR is a derived field that contains aggregate functions and, as such, can only be used in summary report objects and cannot have aggregate functions applied.

To collect fault metrics for an activity area, you will need to create custom events for the workcell. For information on creating custom events, see [View events for an activity area on page 46](#).

Activity area schedules

FactoryTalk Metrics allows you to create time patterns that will be used to calculate the amount of available time for an activity area. The OEE calculation is based on available time, so the calculation will not be accurate unless the available time is defined accurately.

It is not necessary for you to use a time pattern to define available time for an activity area; however, if you do, the OEE calculation for the activity area will not be negatively impacted by the periods of time when the activity area is scheduled to be unavailable (for example, weekends or evenings).

NOTE: To define time patterns, configure composites, and schedule exceptions, you must be granted the Manage Time Pattern privilege by your RSBizWare administrator.

Time patterns

A time pattern defines the availability of an activity area over time, which repeats as necessary during the activity area schedule. We can define the following durations of repeating periods:

- **Day**
A time pattern for a 24-hour day.
- **Week**
A time pattern for a standard 7-day week.
- **Custom**
A time pattern for arbitrary duration, for example, a 14-day cycle or an 8-hour shift.

A time pattern is composed of a default value and a series of time spans. The default value defines the value of the time pattern during intervals where no time span is specified. Each time span specifies the start time, end time, value (for example, Available, Unavailable), and the optional report name for the span. The default value for the time

pattern and the value for the time span can be a named state, a numeric value, or another time pattern. Named states are simply a set of values (for example, 1, 0) to which you have applied descriptions (for example, Available, Unavailable).

The sample time patterns available with FactoryTalk Metrics consist of three 8-hour shift periods, each with a 30-minute break (Unavailable), that make up the work day. The time pattern applies Monday through Friday, and the facility is closed (Unavailable) during the weekends.

The ability to reference other time patterns allows you to build time patterns from other time patterns.

Configure work week time patterns

To configure a work week time pattern:

1. In the **Time Patterns** dialog box, right-click **My Time Patterns**, and then click **New Time Pattern**.

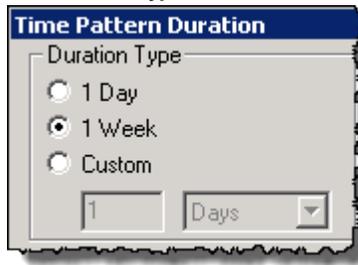
A new time pattern is added to the tree.

2. Change the default name to `work Week`.

3. Under **Duration**, click .

The **Time Pattern Duration** dialog box appears.

4. Under **Duration Type**, select **1 Week**.



5. Click **OK**.

6. Under **Time Spans**, right-click the area and select **New Time Span**.

The **Time Span** dialog box appears.

7. Under **Value Type**, select **Time Pattern**.

8. Under **Value**, select **Work Day**.

9. Under **Start**, select `Monday 0:00` (Monday at midnight).

10. Under **End**, select `Tuesday 0:00` (Tuesday at midnight).

11. Click **OK**.

12. Repeat steps 6-11, and create the following time spans:

Time span for Tuesday

For this item:	Select:
Value Type	Time Pattern
Value	Work Day
Start	Tuesday 0:00
End	Wednesday 0:00

Time span for Wednesday

For this item:	Select:
Value Type	Time Pattern
Value	Work Day
Start	Wednesday 0:00
End	Thursday 0:00

Time span for Thursday

For this item:	Select:
Value Type	Time Pattern
Value	Work Day
Start	Thursday 0:00
End	Friday 0:00

Time span for Friday

For this item:	Select:
Value Type	Time Pattern
Value	Work Day
Start	Friday 0:00
End	Saturday 0:00

Time Spans: <input checked="" type="checkbox"/> Lock		
Value	Start	End
Work Day	Mon 0:00	Tue 0:00
Work Day	Tue 0:00	Wed 0:00
Work Day	Wed 0:00	Thu 0:00
Work Day	Thu 0:00	Fri 0:00
Work Day	Fri 0:00	Sat 0:00

Your **My Time Patterns** folder should contain now the following time patterns:



Configure work day time patterns

To configure a work day time pattern:

1. In the **Time Patterns** dialog box, right-click **My Time Patterns**, and then click **New Time Pattern**.
A new time pattern is added to the tree.

- Change the default name to `Work Day`.



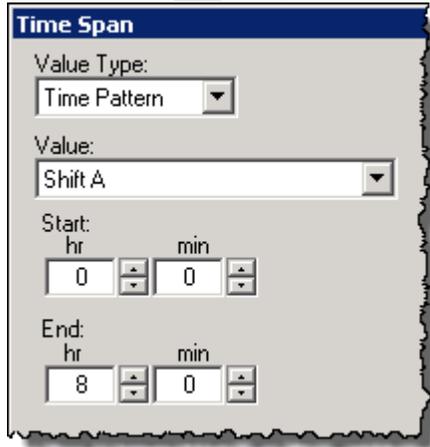
- Under **Time Spans**, right-click the area and then click **New Time Span**.
The **Time Span** dialog box appears.

- Under **Value Type**, select **Time Pattern**.

With the **Time Pattern** option, you will create a time pattern for a particular shift.

- Under **Value**, select **Shift A**.

- Set the start time to `0:00` (midnight), and the end time to `8:00` (AM).



- Click **OK**.

- Under **Time Spans**, right-click the area and then click **New Time Span**.
The **Time Span** dialog box appears.

- Under **Value Type**, select **Time Pattern**.

- Under **Value**, select **Shift B**.

- Set the start time to `8:00` (AM), and the end time to `16:00` (4 PM).

NOTE: Type the time in the 24-hour format.

- Click **OK**.

- Under **Time Spans**, right-click the area and then click **New Time Span**.
The **Time Span** dialog box appears.

- Under **Value Type**, select **Time Pattern**.

- Under **Value**, select **Shift C**.

- Set the start time to `16:00` (4 PM), and the end time to `24:00` (midnight).

A screenshot of a table titled 'Time Spans:'. It has a 'Lo' checkbox checked in the top right corner. The table has three columns: 'Value', 'Start', and 'End'. The rows are: 'Shift A' (0:00, 8:00), 'Shift B' (8:00, 16:00), and 'Shift C' (16:00, 24:00). The 'Shift C' row is highlighted with a blue selection bar.

Value	Start	End
Shift A	0:00	8:00
Shift B	8:00	16:00
Shift C	16:00	24:00

Composites and schedule exceptions

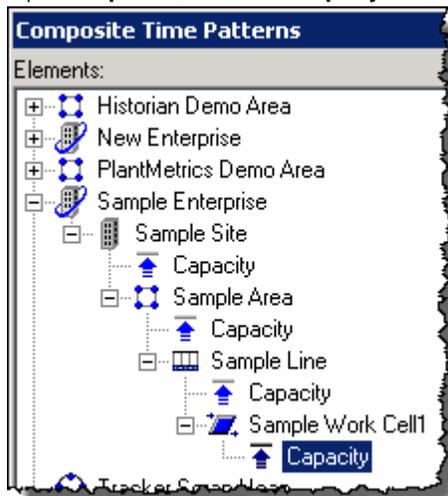
A composite is a base time pattern that is associated with an activity area. A time pattern defines the normal schedule for the activity area, and a composite may have exceptions that define any changes to the normal schedule. These exceptions may be outages (unavailable times) such as holidays or planned maintenance periods, or additional available times such as overtime hours or extended seasonal hours.

Configure composites and exceptions

In this tutorial you will use your **Work Week** time pattern created in [Configure work week time patterns on page 18](#), as the base time pattern for your **Sample Line** and **Sample Work Cell 1** created in [Configure the plant model on page 12](#). You will also schedule an exception for the New Year's Day.

To configure a composite and schedule exceptions:

1. On the **Configure** menu, click **Composite Time Pattern**.
The **Composite Time Patterns** dialog box appears.
2. Under **Elements**, expand the **Sample Enterprise** item until you get to the **Sample Line** item.
3. Expand **Sample Line**, and then click **Capacity**.

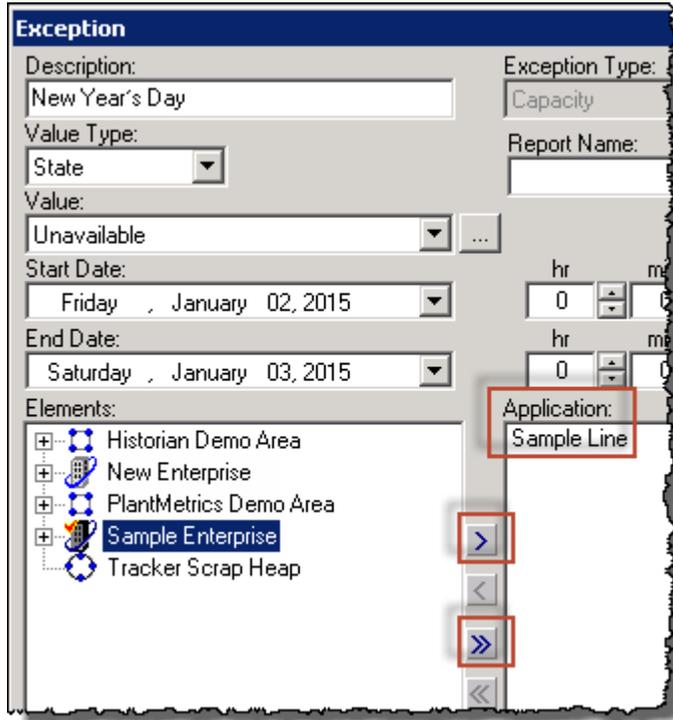


4. In the right pane of the dialog box, under **Exceptions**, right-click the area and select **New**.
The **Exception** dialog box appears.
The activity area for which you are scheduling an exception (in this tutorial it is **Sample Line**), is listed in the right pane of the dialog box, under **Application**.

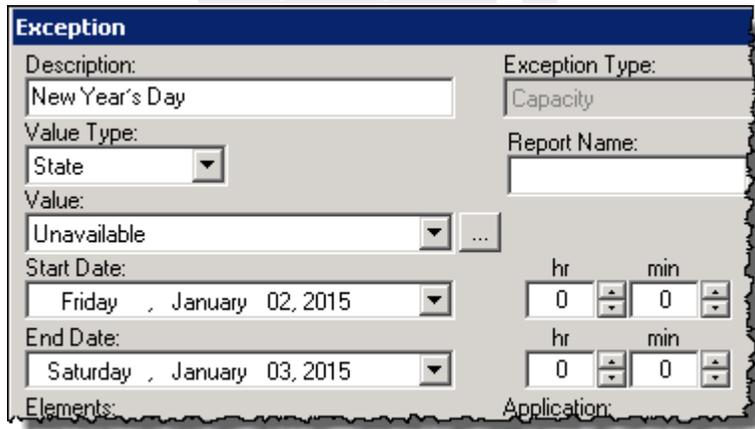


Tip: Exceptions are created for the activity areas that are listed under **Application**.

If you want to add several activity areas to the exception that you are configuring, select them under **Elements**, and then use the arrows to move them under **Application**.



5. Under **Description**, type *New Year's Day*.
6. Leave the default values under **Value Type (State)** and **Value (Unavailable)**.
7. Under **Start Date**, select *Friday, January 02, 2015* at 0:0.
8. Under **End Date**, select *Saturday, January 03, 2015* at 0:0.



9. Click **OK**.

The new exception appears under **Exceptions** in the **Composite Time Patterns** dialog box.

Exceptions:			
Description	Value	Start Date	End Date
New Year's Day	Unav...	1/2/2015 0:00:00.000	1/3/2015 0:00:00.000

Configure OEE parameters

After you have created a plant model and a time pattern, and associated the time pattern with activity areas in the plant, you can set additional parameters that will be used to measure the OEE rating and gather custom events for these activity areas.

FactoryTalk Metrics provides a great deal of flexibility in configuring the parameters that will be used to measure the OEE rating of an activity area. At a minimum, you must provide the following information:

- The FactoryTalk Transaction Manager configuration that will be the link to the control system.
- The amount of time it should take the activity area to produce one good part (ideal cycle time).
- The control system counter keeping track of production counts.

For more sophisticated configurations, you can define other key parameters and custom events. You can connect many of the parameters either to a data point in the control system or to a formula. Depending on the sophistication of your control system, you can use a combination of data points and formulas. This tutorial illustrates the different methods that you can use to configure performance parameters.

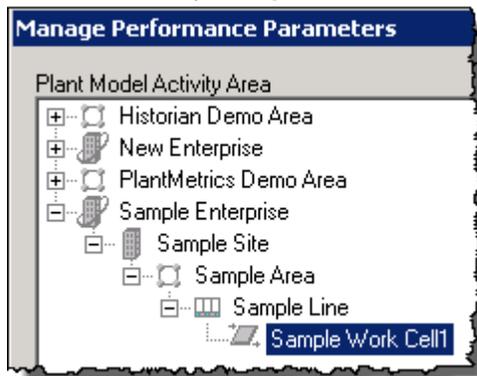
NOTE: To configure OEE performance parameters for an activity area, you must be granted the Manage Performance Parameters privilege by your RSBizWare administrator.

Use the Configuration Console to configure the performance parameters.

To select an activity area for configuration:

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. In the tree, select the activity area for which you want to configure performance parameters.

For this tutorial, select your **Sample Work Cell 1**.



3. Click **Configure**.

The **Configure Performance Parameters** dialog box appears.

In this dialog box, you can configure the parameters that will be used to collect performance data and measure the OEE rating for the activity area.



The upper section of the dialog box provides basic information on the activity area that you have selected, and the following options that you can use with your activity area:

- **Enable Manual Activity Area**
Select this option if you want to create a manual workcell. This indicates that the activity area can be configured without data points assigned.

For more information, refer to the *Online Edits Tutorial* in the FactoryTalk Transaction Manager online help.

- **Enable Data Collection for this Plant Model Activity Area**

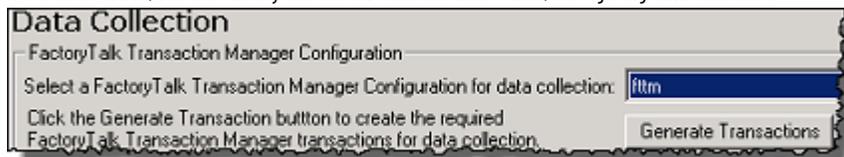
Select this option if you want to start the data collection for the activity area that you have selected.

NOTE: Enabling the data collection for the activity area also consumes one workcell license for the Information Services Manager to which the Configuration Console is connected.

Configure data collection

To configure the Data Collection:

- In the list, select a FactoryTalk Transaction Manager configuration for data collection. Make sure you have a FactoryTalk Transaction Manager configuration defined in the Service Console. For more information, see the *FactoryTalk Metrics Administration Guide*, Configuring data collection.



Configure cycle time

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**. The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**. The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Cycle Time Part Id**.

The Ideal Cycle Time parameter is part of the Throughput value in the OEE equation. It indicates the time, in seconds, which the activity area should take to produce a single good part. It can have a decimal value. The ideal cycle time should represent the maximum theoretical speed of the activity area. If the activity area produces parts slower than the ideal cycle time, the OEE rating will deteriorate.

To configure the Ideal Cycle Time:

Under **Ideal Cycle Time**, in the **Cycle Time Type** list, select one of the following options:

- **Use a single Ideal Cycle Time**

The screenshot shows a dialog box titled "Ideal Cycle Time". It has two input fields: "Cycle Time Type:" with the value "Use a single Ideal Cycle Time" and "Cycle Time:" which is currently empty.

Select this option if the activity area always takes the same amount of time to produce each part, regardless of what type of part is being produced. Parts that take longer than the specified cycle time will negatively impact the OEE rating.

In the **Cycle Time** box, specify the part production time in seconds.

- **Use a PartId/Cycle Time List**

The screenshot shows a dialog box titled "Ideal Cycle Time". It has a "Cycle Time Type:" dropdown menu set to "Use a PartId/Cycle Time List". Below it is a "Lookup" dropdown menu and two buttons: "Create List..." and "Edit List...".

Select this option if you want to improve the accuracy of the OEE rating. With this option, the application uses the specified lookup list to find the Ideal Cycle Time for the type of part that is being produced. This assumes that the activity area always takes the same amount of time to produce a certain type of part.

In the **Lookup** list, select the lookup list that you want to use:

- Click **Create List** to create a list.
- Click **Edit List** to modify the list that you have selected.



Tip: For more information on creating and editing Part Id/Cycle Time lists, see [Configure a lookup list on page 26](#).

- **Monitor an Unscheduled data point for Ideal Cycle Time**

The screenshot shows a dialog box titled "Ideal Cycle Time". It has a "Cycle Time Type:" dropdown menu set to "Monitor an Unscheduled data point for Ideal Cycle Time". Below it is a "Data Point:" field with the text "Drop Cycle Time Data Point Here" and two buttons: "Select..." and "Clear". There is a checkbox labeled "Use a FactoryTalk Transaction Manager Expression to determine the Ideal Cycle Time value." and an "Expression:" field with an "Edit..." button.

Select this option to obtain the most accurate ideal cycle time. With this option, the control system specifies the amount of time it should take to produce a good part.

You can either only select a data point or first select a data point as the ideal cycle time event trigger, and then set the actual ideal cycle time using a FactoryTalk Transaction Manager expression:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device** list, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.
The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.
4. Double-click the data point that you want to use.

The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



Tip: To delete the data point that you have selected, click **Clear**.

5. (Optional) Set the actual ideal cycle time using a FactoryTalk Transaction Manager expression:
 - a. Select the **Use a FactoryTalk Transaction Manager Expression to determine the Ideal Cycle Time value** checkbox.
 - b. Click **Edit**.
The **Expression Editor - Ideal Cycle Time Expression** dialog box appears.
 - c. Create or modify the expression that you want to use.
If you use a FactoryTalk Transaction Manager expression, the only data point it can reference is the one that you have provided in the **Data Point** box.

Configure a lookup list

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Lookup Lists > Part Id/Cycle Times**.
The **Part Id/Cycle Time Lookup List** dialog box appears.
2. Do either of the following:
 - Click **Add**.
 - Select a lookup list, and then click **Edit**.
The **Part Id/Cycle Time List Configuration** dialog box appears.

Use the **Part Id/Cycle Time List Configuration** dialog box to configure a Part Id/Cycle Time Lookup List and its parameters:

- Default cycle time for Total Parts.
- Cycle times for individual Part Ids.

Click the following links to learn how to:

- [Configure default cycle time on page 26](#)
- [Configure ideal cycle time on page 27](#)
- [Manage part ID configurations on page 27](#)
- [Import cycle time values on page 27](#)

Configure default cycle time

To configure the default Cycle Time for Total Parts:

1. In the **List Description** box, type a name for the new Part Id/Cycle Time lookup list.
The name will be displayed in the Part Id/Cycle Time Lookup list in the Part Id/Cycle Time section of the **Configure Performance Parameters** dialog box.
2. In the **Default Cycle Time** box, type a value for the default cycle time for Total Parts in seconds.

Configure ideal cycle time

To configure the Ideal Cycle Time values for individual Part Ids:

1. Under **Part Ids and Cycle Times**, click **Add**.
2. The **Part Id/Cycle Time Values** dialog box appears.

3. In the **Part Id** box, type the name of the Part Id for which you want to set the cycle time.
4. In the **Cycle Time** box, type an ideal cycle time value in seconds.
5. Click **OK**.
The Part Id and its cycle time value appear under **Part Ids and Cycle Times** in the **Part Id/Cycle Time List Configuration** dialog box.
6. Repeat the steps for other Part Ids for which you want to set individual ideal cycle time values.

Manage part ID configurations

To manage Part Id configurations:

- To edit a Part Id configuration, click the Part Id item under **Part Ids and Cycle Times**, and then click **Edit**. The **Part Id/Cycle Time Values** dialog box appears.
- To delete a Part Id configuration, click **Delete**.

Import cycle time values

To import Part Id configurations:

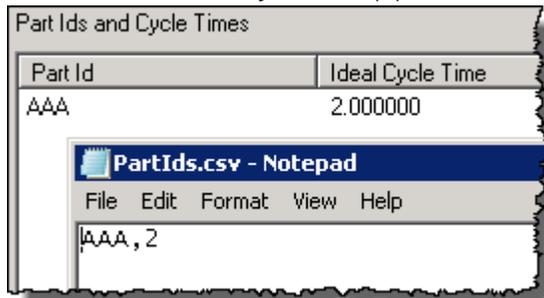
1. Create a text file with Part Id configurations.
2. In the file, type the data in the order in which it will be displayed in the dialog box, that is:
`<Part Id>,<Ideal cycle time>`
3. Separate each chunk of data with a comma, for example:
`AAA,2`
4. Save the file in the .csv format.
5. Under **Previous Import File Path**, click **Import**.

If there are Part Id configurations defined in the dialog box, the following message appears:



6. Click **Yes**.
The **Open** dialog box appears.
7. Navigate to the file that you want to import, and then click **Open**.

The table under **Part Ids and Cycle Times** is populated with the data imported from the file.



Configure part ID

How do I access the dialog box?

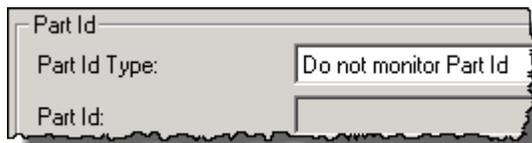
1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Cycle Time Part Id**.

The Part Id parameter tells FactoryTalk Metrics what type of part is being produced by the activity area. Changes in the Part Id value allow FactoryTalk Metrics to track what type of part is being produced. If you always know what kind of part the activity area is producing, you can obtain the OEE ratings for the activity area sorted by part.

To configure the Part Id:

Under **Part Id**, in the **Part Id Type** list, select one of the following options:

- **Do not monitor Part Id**



Select this option if the application does not have information about the types of parts the activity area is producing. The OEE rating for the activity area will always be based on all parts produced by the activity area.

- **Use a single Part Id**

The screenshot shows a dialog box titled 'Part Id'. It contains three fields: 'Part Id Type' with a dropdown menu showing 'Use a single Part Id', and 'Part Id' with an empty text box.

Select this option if the activity area produces only one type of part, and the OEE rating for the activity area will always be associated with that particular type of part.

In the **Part Id** box, type the part ID.

- **Monitor an Unscheduled data point for Part Id**

The screenshot shows a dialog box titled 'Part Id'. It contains three fields: 'Part Id Type' with a dropdown menu showing 'Monitor an Unscheduled data point for Part Id', 'Data Point' with a text box containing 'Drop Part Id Data Point Here', and two buttons: 'Select...' and 'Clear'.

Select this option if you want to monitor a data point in the control system to determine the type of part being produced. Changes in the Part Id value allow FactoryTalk Metrics to track operation conditions to the type of part being produced. If FactoryTalk Metrics knows what kind of part the activity area is producing, you can obtain the OEE rating for the activity area when it is producing a specific type of part:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device** list, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.
The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.
4. Double-click the data point that you want to use.
The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



Tip: To delete the data point that you have selected, click **Clear**.

Configure summarization criteria

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Summarization Criteria**.

Summarization criteria take the form of a user-defined parameter, similar to the Shift, Part Id, and Ideal Cycle Time parameters, for which data can be collected. When the value of the parameter changes, it triggers the summarization of historical performance data for the activity area. The collected values can then be used to filter OEE performance data for the activity area. For example, if your system is configured to collect a user-defined summarization criterion called Operator ID, you will be able to calculate the OEE performance for the selected activity area when a particular operator is running this equipment.

NOTE: User-defined summarization criteria are defined by the RSBizWare administrator in the Service Console.

For information on defining summarization criteria, refer to *FactoryTalk Metrics Administration Guide*, section *Configure summarization criteria*.

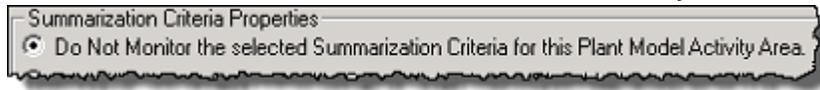
To configure summarization criteria:

1. In the **Select Summarization Criteria** list, select the parameter for which you want to collect data.



2. Select one of the following options:

- **Do Not Monitor the selected Summarization Criteria for the Plant Model Activity Area.**



Select this option if you do not want the application to collect values for this parameter. The OEE rating for the activity area will always be based on all user-defined summarization criterion values of this type.

- **Specify a default Summarization Criteria Value for this Plant Model Activity Area.**



Select this option if you want to set a single value for the summarization criterion. The OEE rating for the activity area will always be based on this value. For example, if a particular operator always runs this piece of equipment, you may set the Operator ID parameter as the default value.

In the **Value** box, type the name of the parameter that you want to use.

- **Specify an Unscheduled Data Point to provide Summarization Criteria information for this Plant Model Activity Area.**



Select this option if you want to monitor a data point in the control system to determine the value for the summarization criterion. Changes in the value allow FactoryTalk Metrics to track operation conditions to a specific value. For example, for the Operator ID, this would allow FactoryTalk Metrics to track which operator is running the machinery, and allow you to obtain the OEE rating for the activity area if a specific operator is running the machinery:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device list**, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.
The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.

4. Double-click the data point that you want to use.

The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



Tip: To delete the data point that you have selected, click **Clear**.

Configure part count

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Part Count**.

The Part Count parameter is part of the Throughput value in the OEE equation. It indicates how many parts have been produced by the activity area. FactoryTalk Metrics compares the rate of items produced to the value given for the ideal cycle time, so the unit of measure is not important (however, it must be the same unit of measure as the ideal cycle time).

It is important to make sure that the total part counter and the good/bad part counter fire at the same time (for example, when the part leaves the activity area). If the total part counter fires when a part arrives, but the good/bad part counter does not fire until the part leaves, the two part counters may be incremented in different summarization periods, resulting in misleading part counts in reports.

To configure the Part Count parameter:

1. Click the tab for the type of part count that you want to collect:
 - **Total Part Count**
 - **Good Part Count**, or
 - **Scrap/Bad Part Count**

NOTE: It is not necessary to collect all three count values; however, at the minimum, you must collect either of the following:

- The good part count.
- The total part count and scrap/bad count (from which the good part count can be calculated).

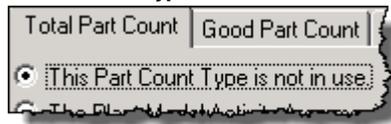
For activity areas configured as manual activity areas, you do not have to collect any part counts (that is, Total, Good, Scrap/Bad).



Tip: The options listed in all three tabs are identical for all part count types.

2. Select one of the following options to indicate how FactoryTalk Metrics should determine the number of parts of the selected type (total, good, or scrap/bad) that the activity area has produced:

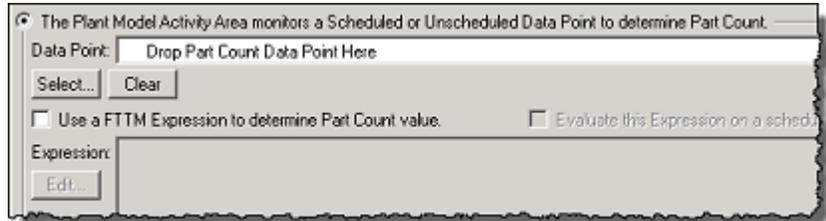
- **This Part Count Type is not in use.**



Select this option if you do not want to collect this type of part count.

For manual activity areas, you can select this option for all three tabs.

- **The Plant Model Activity Area monitors a Scheduled or Unscheduled Data Point to determine Part Count.**



Select this option if you want a data point in the control system to report the number of parts produced by the activity area.

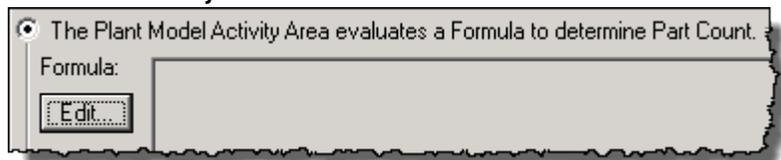
You can configure the way the activity determines part counts by monitoring data points in the following ways:

[By selecting an unscheduled data point on page 32](#)

[By selecting first an unscheduled data point as the part count event trigger, and then setting the actual part count using a FactoryTalk Transaction Manager expression on page 33](#)

[By setting the activity area to determine the value of a FactoryTalk Transaction Manager expression on a scheduled basis on page 33](#)

- **The Plant Model Activity Area evaluates a Formula to determine Part Count.**



Select this option if the number of parts produced is not contained in a single register in the control system. For example, if the activity area for which you configure performance parameters is actually two separate physical machines, you can create a formula to add the part counts from the two machines, in order to create a single good part count.

Click **Edit** to [define the formula on page 34](#).

Use an unscheduled data point

To use an Unscheduled Data Point:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device** list, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.

The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.

4. Double-click the data point that you want to use.

The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.

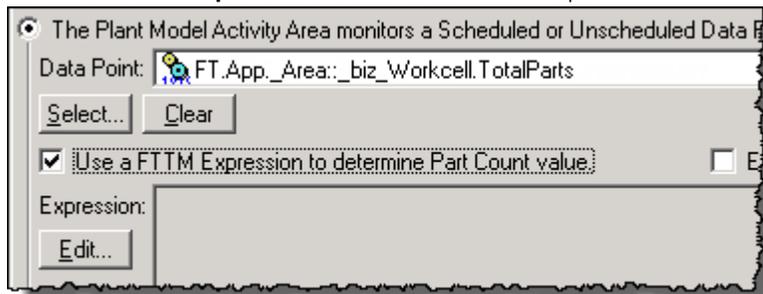


Tip: To delete the data point that you have selected, click **Clear**.

Use an FTTM expression

To set the actual Part Count using an unscheduled Data Point and a FactoryTalk Transaction Manager expression:

1. [Choose an unscheduled data point on page 32.](#)
2. Check the **Use a FTTM Expression to determine Part Count value** option.



3. Click **Edit**.
The **Expression Editor - Total Part Count Expression** dialog box appears.



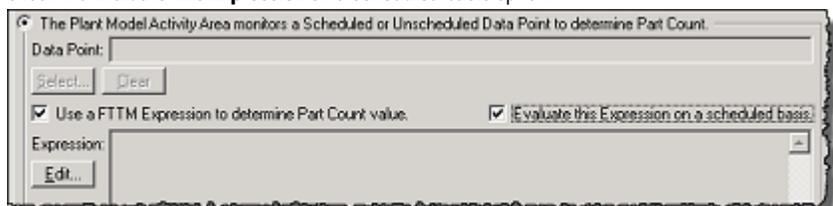
Tip: The title of the dialog box reflects the part count type for which you are performing the actions.

4. Create or modify the expression that you want to use.
If you use a FactoryTalk Transaction Manager expression with this option, the only data point it can reference is the one selected in the **Data Point** box.

Evaluate an FTTM expression

To use a FTTM expression on a scheduled basis:

1. Check the **Use a FTTM Expression to determine Part Count value** option.
2. Check the **Evaluate this Expression on a scheduled basis** option.



3. Click **Edit**.
The **Formula Parts** wizard appears.
4. [Use the wizard to define the formula. on page 34](#)

Configure a formula

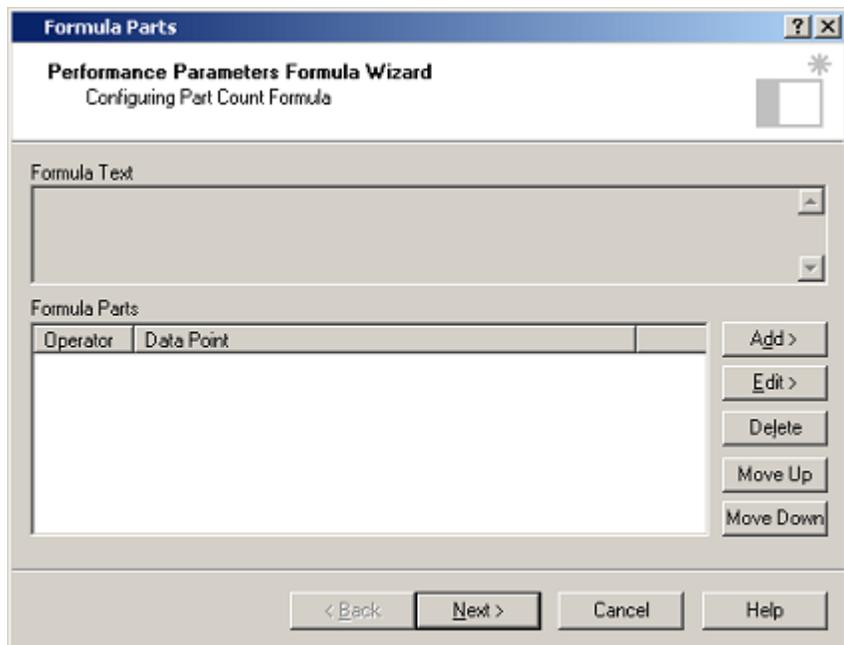
How do I access the dialog box?

1. In the left pane of the **Configure Performance Parameters** dialog, click **Part Count**.
2. Click the **Total Part Count**, **Good Part Count**, or **Scrap/Bad Part Count** tab.
3. Click **The Plant Model Activity Area evaluates a Formula to determine Part Count**.
4. Click **Edit**.

The performance parameter formulas are used to perform an advanced calculation for an OEE Performance Parameter. They consist of Boolean or arithmetic operations that are applied to data point values. A formula can be based on operations against multiple data points, so the collection of data from a formula allows you to collect more specific information about your activity area.

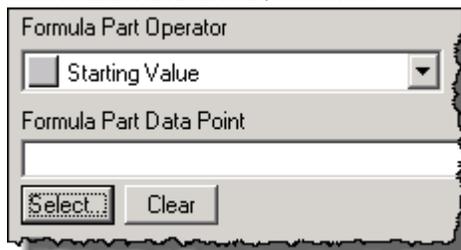
To configure a formula

1. In the **Formula Parts** wizard, click **Add >**.



Under **Formula Part Operator**, the **Starting Value** operator is preselected, since it is the first value in the arithmetic formula.

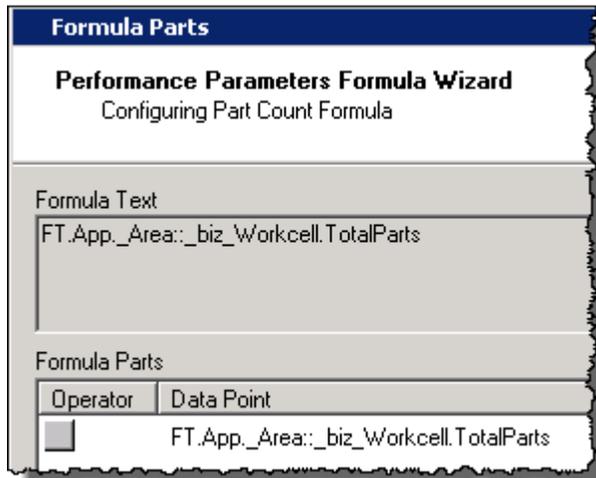
2. Under **Formula Part Data Point**, click **Select**.



The **Select Data Point** dialog box appears.

3. Under **Data Points**, double-click the data point that you want to evaluate in the formula.
4. Click **Close**, and then click **Next**.

The formula part that you have created is displayed under **Formula Text** and **Formula Parts**.

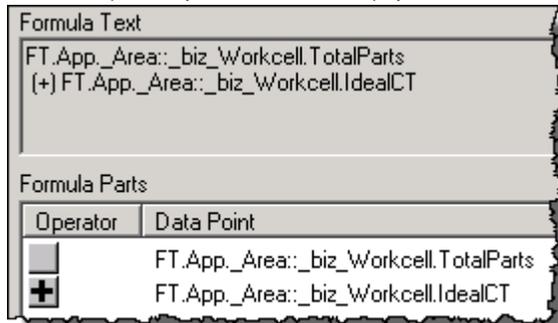


- Repeat steps 1-4 to create another formula part.
You can add values to or subtracts values from the starting values.

To add another value

- Under **Formula Parts**, click **Add >**.
- Under **Formula Part Operator**, select **(+) Add Value**.
- Under **Formula Part Data Point**, click **Select**.
- Under **Data Points**, double-click the data point that you want to evaluate in the formula.
- Click **Close**, and then click **Next**.

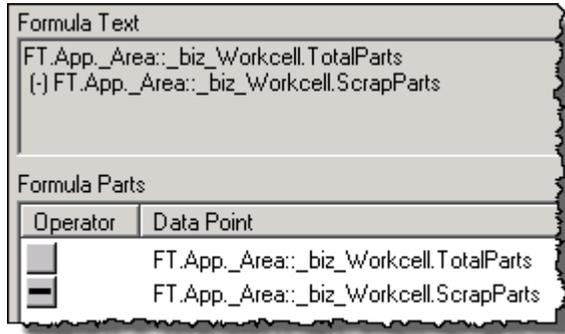
The formula part that you have created is displayed under **Formula Text** and **Formula Parts**.



To subtract another value

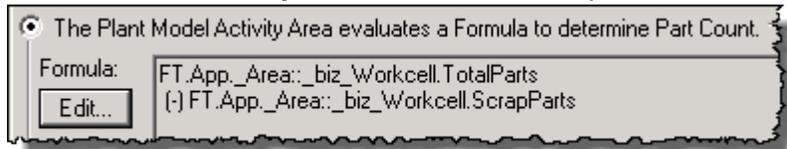
- Under **Formula Parts**, click **Add >**.
- Under **Formula Part Operator**, select **(-) Subtract Value**.
- Under **Formula Part Data Point**, click **Select**.
- Under **Data Points**, double-click the data point that you want to evaluate in the formula.
- Click **Close**, and then click **Next**.

The formula part that you have created is displayed under **Formula Text** and **Formula Parts**.



6. Click **Finish**.

The formula is added to the **Configure Performance Parameters** dialog box.



Availability

Availability is the ratio of running time to available time, and is a key component of the OEE formula.

$$\text{Availability} = \text{Running Time} / \text{Available Time}$$

Available Time is also one of the three variables in the OEE calculation itself:

$$\text{OEE} = (\text{Good Part Count} \times \text{Ideal Cycle Time}) / \text{Available Time}$$

The calculation of Available Time is important to get accurate OEE data. The fundamental issue is to determine when a machine (activity area) should be producing and when it should not. Some companies count all shift time as available time, so any non-productive time, no matter what the cause, is considered lost capacity and reduces OEE. Others exclude some types of non-productive time from the total available time, which results in higher overall OEE values. This is not done to inflate OEE scores, but to determine how efficiently the machine is performing more accurately. Such exclusions can include:

- Scheduled breaks, meetings, and so on.
- Planned maintenance.
- External conditions that help prevent the machine from working, such as being starved or blocked.

In FactoryTalk Metrics, Available Time is the result of two other measures: Scheduled Availability and Monitored Availability.

Scheduled Availability is the expected availability that results from a predictable shift schedule (including exceptions such as meetings or planned maintenance).

Monitored Availability is the determination of machine availability based on the real-time events that are occurring on the plant floor (such as blocked/starved). Monitored Availability may override Scheduled Availability to make a machine unavailable when it would be available otherwise.

Because collecting accurate Available Time is so important, there are several options within FactoryTalk Metrics for configuring both Scheduled Availability and Monitored Availability. In addition, overall Available Time can be configured to accumulate when both the Scheduled Availability and Monitored Availability conditions are true, or when only one of them is true. The methods used for determining Available Time are configured separately for each activity area.

The following approaches can be used to determine if a machine is available:

- Defining a schedule (time pattern), which defines specific periods of available and unavailable time that repeat into the future, and which is subject to exceptions like holidays or scheduled maintenance activities.
- Combining a time pattern optionally with Monitored Availability, so that a control system condition can override the predetermined schedule. This is how dynamic conditions such as blocked and starved are commonly handled.

The Monitored Availability may be determined by:

- A control system condition.
This may be the state of a single data point or the resolution of a complex expression or formula involving one or more data points.
- The current state of the machine.
When machine states are configured, there is an option to specify whether that state indicates that the activity area is available or not available.
- Collecting shift information, scheduled availability information, or both from the control system. If shift schedules change frequently, this option is more flexible than using a time pattern. Using this method, both shift information and an optional Scheduled Availability value are collected from the control system and used to define availability.

Configure scheduled availability

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Scheduled Availability**.

The Scheduled Availability parameter is part of the Availability value in the OEE equation. It indicates when the activity area is supposed to be available to produce parts.

Scheduled Availability and Monitored Availability are used together to determine the [availability on page 36](#) component of the OEE equation and to accumulate available time. Together, these values indicate when the activity area is supposed to be available to produce parts and define shift information. Scheduled Availability provides the basic availability information for the activity area, and provides the shift information. This is most commonly done by means of a fixed and repeating time pattern.

To configure Scheduled Availability:

Select one of the following options to indicate how FactoryTalk Metrics should determine when the activity area is available to produce parts:

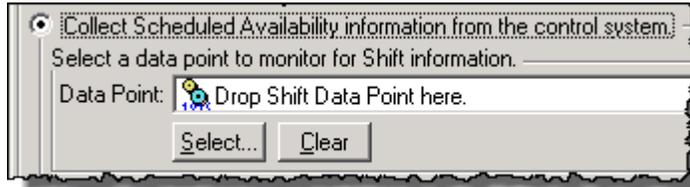
- **The Plant Model Activity Area is scheduled to be available at all times.**



Select this option if the activity area runs 24 hours a day, seven days a week, or you intend to rely on the Monitored Availability to determine the availability.

With this option selected, it is difficult to determine when the activity area is available. As a result, non-production time (for example, weekends) may cause the OEE rating of the activity area to be artificially low. Since no shift information is collected, the reporting by shift is not allowed.

- **Collect Scheduled Availability information from the control system.**

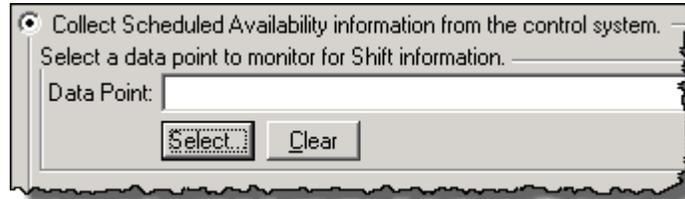


Select this option if shift schedule changes on the site are frequent and variable.

With this option selected, both shift information and an optional Scheduled Availability value are collected from the control system and used to define availability.

You can configure the option in the following ways:

- **Select a data point to monitor for Shift information.**



The data point should be an unscheduled numeric data point that will contain the current shift number:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device** list, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.
The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.
4. Double-click the data point that you want to use.
The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



Tip: To delete the data point that you have selected, click **Clear**.

- **Select a lookup list to provide a description for the numeric shift value collected from the control system.**

How do I access the dialog box?

1. In the left pane of the **Configure Performance Parameters** dialog box, click **Scheduled Availability**.
2. Click **Collect Scheduled Availability information from the control system**.
3. Under **Select a lookup list to provide a description for the numeric shift value collected from the control system**, click **Create**.

When a value is collected for the Shift Id from the control system, that value is numeric and can be associated with a text value to be used as the Shift Description. For example, the collected Shift Id value of 1 may be associated with a Shift Description of Shift 1 Crew A. The associated shift description values are stored in lookup lists.

To configure a Shift Description lookup list:

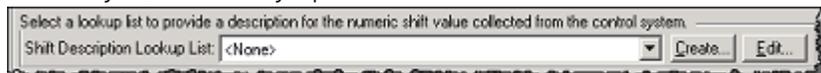
1. In the **Lookup Code Description** box, type a name for the Shift Description lookup list.
2. Under **Lookup Code Values**, click **Add**.
3. The **Shift Description Lookup Code Value** dialog box appears.
4. In the **Value** box, type a value.
5. In the **Description** box, type a description of the value.
6. Click **OK**.

The value appears under **Lookup Code Values**.

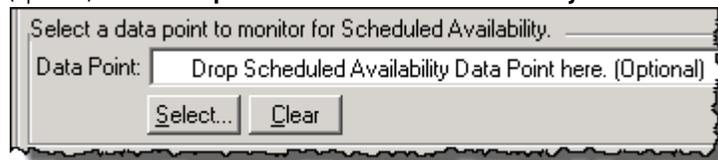
Instead of manually configuring a lookup code list, you can import an existing list from a comma-separated values file (.csv).

NOTE: If a shift description lookup list already contains values, and you intend to import other values to this list, the original values will be replaced with the new ones.

In this dialog box, do the following steps:



- a. Select the lookup list that you want to use:
 - Click **New** to create a list.
 - Click **Edit** to modify the list that you have selected.
- b. (Optional.) **Select a data point to monitor for Scheduled Availability.**



- c. Click **Select**.
The **Select Data Point** dialog box appears.
- d. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device list**, select the device from which you want to load data points.
- e. At the top of the dialog box, click **Refresh Points**.
The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.
- f. Double-click the data point that you want to use.

The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



Tip: To delete the data point that you have selected, click **Clear**.

If no data point is selected, the scheduled availability will be determined from the current shift.

If the optional data point for the scheduled availability is selected, that is the only value used to determine the state of the scheduled availability.

If only the Shift Id data point is selected, the plant model activity area will be considered to be scheduled available when the Shift Id value indicates that a shift is active.

The value collected for Shift Id is interpreted as an integer value.

A positive value indicates that the plant model activity area is in an active shift.

A zero or negative value indicates that the plant model activity area is out of shift.

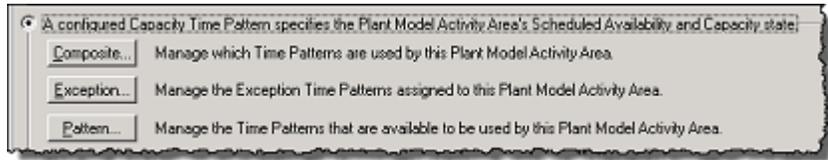
Any time that it is in an active shift is considered to be scheduled available, and any out-of-shift time is scheduled unavailable.

The following table illustrates how data collection will behave for different configurations of Shift Id and Scheduled Availability.

Shift Data Point Value	Scheduled Available Data Point Value	Scheduled Availability Accumulating	Shift information that is written to the database
Value > 0	Not Selected	Yes	> 0 value with description.
Value is 0	Not Selected	No	If previous shift value > 0 then -1 * previous Shift value. Otherwise, -1 for shift number with no shift description.
Value < 0	Not Selected	No	< 0 value for shift number with no shift description.
Value > 0	Value is not 0	Yes	> 0 value with description.
Value > 0	Value is 0	No	> 0 value with description.
Value is 0	Value is not 0	Yes	If previous shift value > 0 then -1 * previous Shift value. Otherwise, -1 for shift number with no shift description
Value is 0	Value is 0	No	If previous shift value > 0 then -1 * previous Shift value. Otherwise, -1 for shift number with no shift description.
Value < 0	Value is not 0	Yes	< 0 value for shift number with no shift description.

Shift Data Point Value	Scheduled Available Data Point Value	Scheduled Availability Accumulating	Shift information that is written to the database
Value < 0	Value is 0	No	< 0 value for shift number with no shift description.

- **A configured Capacity Time Pattern specifies the Plant Model Activity Area's Scheduled Availability and Capacity state.**



Select this option to define when the activity area is scheduled to be available. If the availability of the activity area is based on a time pattern, the OEE rating of the activity area will not be negatively affected by time periods that are scheduled as unavailable (for example, weekends, evenings).

Click one of the available buttons to access the respective editors that you can use to create or modify composites, exceptions, or time patterns:

- Click **Composite** to assign time patterns and exceptions to activity areas.
- Click **Exception** to define availability exceptions and apply them to appropriate activity areas.
- Click **Pattern** to define repeating time patterns of available time, unavailable time, and shifts.

If a site changes shift schedules frequently, the **Collect Scheduled Availability information from the control system** option is more flexible than using a time pattern.

Create lookup lists

When a value is collected for the Shift Id from the control system, that value is numeric and can be associated with a text value to be used as the Shift Description. For example, the collected Shift Id value of 1 may be associated with a Shift Description of Shift 1 Crew A. The associated shift description values are stored in lookup lists.

How do I access the dialog box?

1. In the left pane of the **Configure Performance Parameters** dialog box, click **Scheduled Availability**.
2. Click **Collect Scheduled Availability information from the control system**.
3. Under **Select a lookup list to provide a description for the numeric shift value collected from the control system**, click **Create**.

To configure a Shift Description lookup list:

1. In the **Lookup Code Description** box, type a name for the Shift Description lookup list.
2. Under **Lookup Code Values**, click **Add**.
The **Shift Description Lookup Code Value** dialog box appears.
3. In the **Value** box, type a value.
4. In the **Description** box, type a description of the value.
5. Click **OK**.

The value appears under **Lookup Code Values**.

Instead of manually configuring a lookup code list, you can import an existing list from a comma-separated values file (.csv).

NOTE: If a shift description lookup list already contains values, and you intend to import other values to this list, the original values will be replaced with the new ones.

Configure monitored availability

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Monitored Availability**.

The Monitored Availability parameter is part of the Availability value in the OEE equation. The parameter indicates when the activity area is available to produce parts. While the activity area may be scheduled to be available at a specified time, it may not actually be available at that time. An example of this is when the activity area is scheduled to be available, but is not able to work, because it is waiting for parts from an upstream process. Using the Monitored Availability parameter helps understand which machine in the facility really causes the problems. For the Monitored Availability parameters, you can create Boolean formulas.

The benefit of using Monitored Availability to determine the available time for an activity area is more accurate efficiency measurements. For example, even though an activity area can be scheduled to be available for an 8-hour shift, there can be times during that shift when the machine is not capable of producing output through no fault of its own. It might be starved by an upstream process, blocked by a downstream process, or it may have no work orders. If these times are excluded from the available time, the result is a more accurate picture of the machine's actual efficiency. To get this information, you must use one of the Monitored Availability options. You will also want to track these non-productive times as custom events or machine states in order to get an accurate picture of how much production time is being lost and where the fault lies.

By default, an activity area must be both Scheduled Available and Monitored Available to be overall available and to accumulate Available Time.

To configure Monitored Availability:

Select one of the following options to indicate how the application should determine the actual availability of the activity area:

- **The Plant Model Activity Area is always available.**



Select this option if you want to disable Monitored Availability. The overall availability will be determined based on the state of Scheduled Availability only. As a result, the non-production time that is not the fault of the activity area (for example, when the machine is waiting for parts) will cause the OEE rating of the activity area to be artificially low.

- **The Plant Model Activity Area determines Monitored Availability based on the current Machine State.**

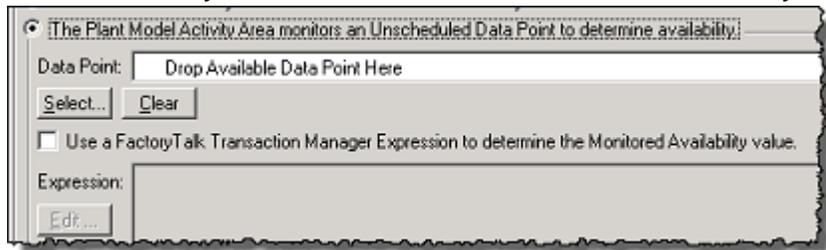


Select this option if you want to use machine state to determine Monitored Availability.

When machine states are defined, the (Monitored) Availability of each machine state is set. If machine states are configured for the current activity area, then at any point in time the activity area will be in only one machine state, and the Monitored Availability of that machine state (either available or unavailable) will be used.

For more information, see [Machine states on page 72](#).

- **The Plant Model Activity Area monitors an Unscheduled Data Point to determine availability.**



Select this option if you want to improve the accuracy of the OEE rating.

For example, if you base the monitored availability on the data point that contains the running bit of an upstream unit, the OEE of the current unit will not be negatively affected when it is waiting for parts (the upstream unit is not running).

You can either only select a data point or first select a data point as the availability event trigger, and then set the actual availability value using a FactoryTalk Transaction Manager expression.

Proceed as follows:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device** list, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.
The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.
4. Double-click the data point that you want to use.
The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



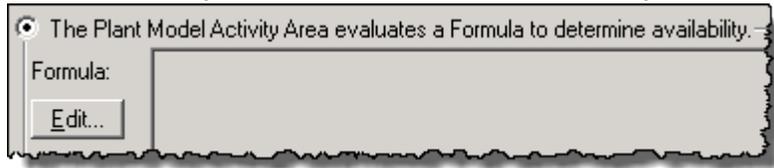
Tip: To delete the data point that you have selected, click **Clear**.

5. (Optional) Set the actual availability value using a FactoryTalk Transaction Manager expression:
 - a. Check the **Use a FactoryTalk Transaction Manager Expression to determine the Monitored Availability value** box.
 - b. Click **Edit**.
The **Expression Editor - Monitored Availability Expression** dialog box appears.

- c. Create or modify the expression that you want to use.

If you use a FactoryTalk Transaction Manager expression, the only data point it can reference is the one that you have provided in the **Data Point** box.

- **The Plant Model Activity Area evaluates a Formula to determine availability.**



Select this option if you want to determine the availability of the activity area based on the results of a formula.

This option specifies a formula that is constructed from one or more unscheduled numeric or binary data points, and when the result of that formula has a nonzero or true value, it indicates that the activity area is Monitored Available.

For example, if you base the monitored availability on the running state of the upstream and downstream units, you can determine that the activity area is available because it is not waiting for parts and is not blocked.

Proceed as follows:

1. Click **Edit**.
The **Formula Parts** wizard appears.
2. [Use the wizard to define the formula. on page 34](#)
3. Click **Apply**.

The Monitored Availability configuration results in creating several system events contained in an event category called Available (in addition to those created by the Scheduled Availability configuration).

To view the events, in the left pane of the **Configure Performance Parameters** dialog box, under **Custom**, click **Events**.

For more information, see [View events for an activity area on page 46](#).

The data from the events is logged to the database and used to calculate OEE and other metrics. The events include (depending on selected options):

- Activity Area Available - Formula
- Activity Area Available - Point
- Available Formula Point

Configure running state

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, click **Running State**.

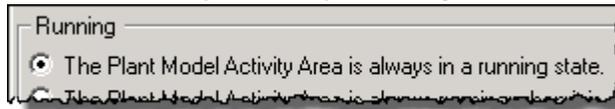
The Running State parameter is part of the [availability on page 36](#) value in the OEE equation. The parameter allows the control system to indicate when the activity area is actually producing products.

For the Running State parameters, you can create Boolean formulas.

To configure the Running State:

Select one of the following options to indicate how FactoryTalk Metrics should determine when the activity area is actually running and producing parts:

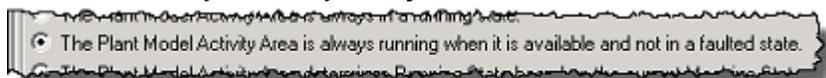
- **The Plant Model Activity Area is always in a running state.**



Select this option if you want the running time to be set equal to the available time.

With this option selected, you will not be able to isolate the contribution that Availability makes to the OEE value.

- **The Plant Model Activity Area is always running when it is available and not in a faulted state.**



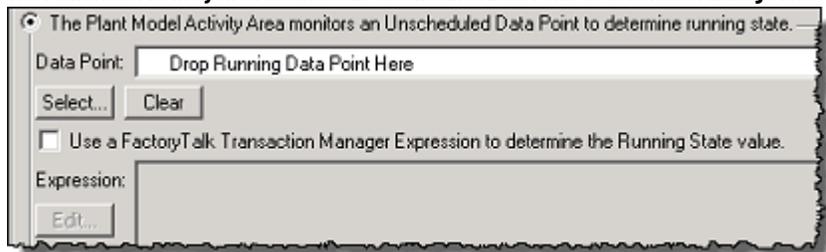
Select this option if you want the running state of the activity area to be based on the availability and the fault state of the activity area. This enables you to eliminate unavailable time and downtime from the OEE rating.

- **The Plant Model Activity Area determines Running State based on the current Machine State.**



Select this option if you want the activity area to be considered in the running state, when the current machine state indicates the running state. For more information, see [Machine states on page 72](#).

- **The Plant Model Activity Area monitors an Unscheduled Data Point to determine running state.**



Select this option if you have a data point in the control system that contains a running bit. If you base the Running State parameter on the data point that contains the running bit of the selected activity area, the activity area's running time will be stored in the database for later reporting.

You can either only select a data point, or first select a data point as the running state event trigger, and then set the actual running state value using a FactoryTalk Transaction Manager expression:

1. Click **Select**.
The **Select Data Point** dialog box appears.
2. Under **Filtering Tools**, in the **FT Transaction Manager Topic/Device** list, select the device from which you want to load data points.
3. At the top of the dialog box, click **Refresh Points**.

The **Data Points** area at the bottom of the dialog box is populated with data points for the selected device.

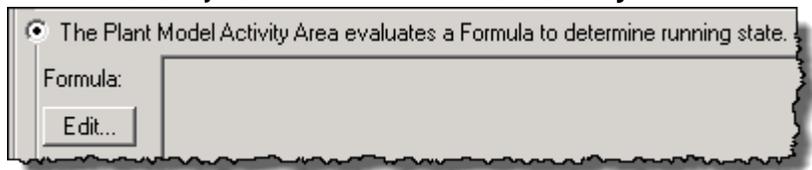
4. Double-click the data point that you want to use.

The data point appears in the **Data Point** box in the **Configure Performance Parameters** dialog box.



Tip: To delete the data point that you have selected, click **Clear**.

5. (Optional) Set the actual running state value using a FactoryTalk Transaction Manager expression:
 - a. Check the **Use a FactoryTalk Transaction Manager Expression to determine the Running State value** box.
 - b. Click **Edit**.
The **Expression Editor - Running State Expression** dialog box appears.
 - c. Create or modify the expression that you want to use.
If you use a FactoryTalk Transaction Manager expression, the only data point it can reference is the one that you have provided in the **Data Point** box.
- **The Plant Model Activity Area evaluates a Formula to determine running state.**



Select this option if the running state for the activity area is determined by several data points in the control system. For example, if you base the Running State parameter on the running state of the activity area and the part jam bit or fault indicator bit, you can determine that the activity area is actually running because it is not jammed nor in a fault condition.

Proceed as follows:

1. Click **Edit**.
The **Formula Parts** wizard appears.
2. [Use the wizard to define the formula on page 34.](#)

Generate events

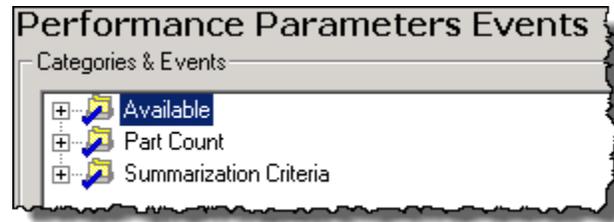
When you have finished configuring your performance parameters, click **Apply**. The application will create system-generated Performance Parameter events.

View events for an activity area

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, under **Custom**, click **Events**.

The Performance Parameter events are used by FactoryTalk Metrics to collect data for performance monitoring.



There are two types of the Performance Parameter events: [system-generated on page 47](#) and [user-defined on page 49](#).

Both types of the events can be [manual events on page 50](#).

To manage events:

- To add a custom event for the activity area, click **New**.
For more information, see [User-defined events on page 51](#).
- To edit an event, select it, and then click **Edit**.
- To remove an event, select it, and then click **Delete**.



Tip: You cannot delete user-defined events while the performance parameter configuration is enabled.

- To change the order of the events within the categories, click **Move Up** or **Move Down**.



Tip: The position of the events in the tree will also be the position of the events on the FactoryTalk Metrics Detail report.

- To copy a user-defined event from another performance parameter configuration to the current performance parameter configuration, click **Copy**.
- To import new performance parameter events that you have created or overwrite existing performance parameter events that you have modified in Excel (.csv) or XML (.xml) files, click **Import**.
- To export existing performance parameter event information to an Excel (.csv) or XML (.xml) file, click **Export**.

System-generated events

System-generated (default) events are created and maintained by the FactoryTalk Metrics software and reflect the selections that you have made for the Performance Parameters configuration. You are only able to edit the description of a system-generated event. All other properties of the events are locked.

System-generated events cannot be deleted.

System-generated events that may be created include:

- **Schedule Available**
If a schedule is assigned to a workcell, a Schedule Available event record will be created when the schedule indicates the workcell should be available. That record will close when the schedule indicates the workcell is

no longer available. So there will be a Schedule Available event record in the database for every continuous period of schedule availability for every workcell.

- **Schedule Exception Unavailable**

A Schedule Exception Unavailable event record is created for every continuous time period where Schedule Exception Unavailable Time occurs. This Unavailable time is associated with the schedule, and thereby an event record will be created for every workcell that uses the schedule.

- **Overall Available**

An Overall Available event record is created for each workcell for each continuous period of Overall Availability. Overall Availability considers all of the applicable availability factors that may determine if a workcell is available: schedule, schedule unavailable time, availability data point, and activity area exception unavailable time. The time spent in an Overall Available status is also captured in the Available Seconds field of the PlantMetrics Workcell History report data source.

- **Activity Area Exception Unavailable**

An event record will be created for every continuous period that a workcell experiences Exception Unavailable Time.

- **Activity Area Available - Point**

An event record will be created for every continuous period that a workcell is available as defined by an activity area Availability data point, which is specified in the Availability section of the Performance Parameter screen. A record will be created every time the Availability point in the control system goes high, and closed when it goes low. If an Availability formula is used, there will be an event created for each component of the formula.

- **Running - Point**

An event record will be created for every continuous period that a workcell is Running as defined by a Running data point, which is specified in the Running section of the Performance Parameter screen. A record will be created every time the Running point in the control system goes high, and closed when it goes low. If a Running formula is used, there will be an event created for each component of the formula.

- **Activity Area Part Count - Formula**

This system-level event is created when a part count formula is used in a workcell. An event record is created when data collection begins, remains open for as long as the data for the Part Count Formula is collected, and is subject to the event data summarization rules. Each record contains a zero for the start value and the cumulative result of the part count formula over the time duration of the event record for the end value.

- **Part Count Formula Point**

One of these system-level events is created for every component of a part count formula, when used in a workcell. An event record is created when data collection begins, remains open for as long as the data for the Part Count Formula is collected, and is subject to the event data summarization rules. Each record contains a zero for the start value and the cumulative change of the formula data point value over the time duration of the event record for the end value.

- **Activity Area Part Count - Point**

This system-level event is created when a data point is used for a part count in a workcell (not a part count formula). An event record is created when data collection begins, remains open for as long as the data for the Part Count Point is collected, and is subject to the event data summarization rules. Each record contains a zero for the start value and the cumulative change of the part count data point value over the time duration of the event record in the end value.

For more information on the event data summarization rules, see Set the Event Data Summarization Parameters in the *FactoryTalk Metrics Online Help*.

User-defined events

User-defined events are custom events that are used to collect extra data that you would like to associate with the existing performance data. By defining custom events, you can direct FactoryTalk Metrics to monitor specific bits or registers in the plant control system, and maintain historical records on the behavior of those data points. For example, you can create user-defined events to trap and record downtime occurrences, e-stops, the upstream/downstream status, machine state information, and operator input.

The ability to direct FactoryTalk Metrics to monitor custom events in the control system is powerful, because it allows you to customize FactoryTalk Metrics for your unique situation and objectives.

It is up to you what is captured and how it is interpreted. There is no enforced limit to the number of custom events that can be associated with a plant model activity area in FactoryTalk Metrics. However, the addition of each new event consumes more resources from all the system's components.

The performance parameters for a user-defined event include:

- **Identifying information**

The plant model activity area (referred to as "workcell description" in the FactoryTalk Metrics event history report data source), event category (a user-defined grouping or folder of related events), and event description (user-defined).

For more information, see FactoryTalk Metrics Event History Report Data Source in the Configuration Console online help.

- **Summarization rules**

Define how FactoryTalk Metrics will handle the creation of multiple summary records in the database for a single event occurrence.

For more information, see Set the Event Data Summarization Parameters in the Configuration Console online help.

- **Trigger**

Defines how the event starts and ends (for example, a bit in the control system goes high to signal the start of the event and it goes low at the end of the event).

For more information, see Set the Event Trigger Parameters in the Configuration Console online help.

- **Additional data**

Optionally, an additional data point can be collected at the start or end of the event, or a counter can be monitored through the duration of an event. The additional data collected may be the event reason code entered by the operator, explaining why the event occurred.

For more information, see Collect Additional Event Information in the Configuration Console online help.

- **Event fault metrics**

Not all events are relevant in the calculation of fault metrics. Specify how the event should be used when calculating fault metrics (Mean Time Between Failure, Mean Time To Repair). **Mean Time Between Failure** and **Mean Time to Repair** are derived fields that contain aggregate functions and, as such, they can only be used in summary report objects, and you cannot apply additional aggregate functions to them.

For more information, see Set the Event Fault Metric And Machine State Options in the Configuration Console online help.

- **Event reporting properties**

The reporting value property determines the type of value that is reported for the event. The severity level property determines the severity that is associated with the event. This is useful for reporting and sorting events.

For more information, see Set the Event Reporting Properties in the Configuration Console online help.

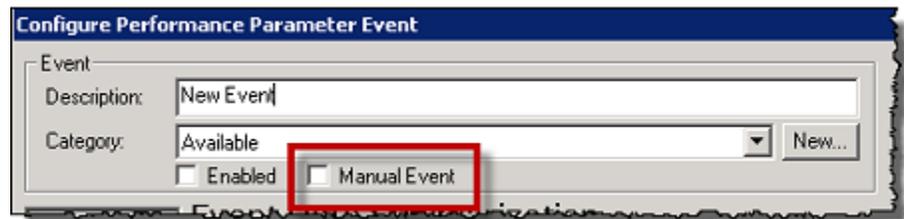
Manual events

Manual events are events without a physical data point attached to them. They can be both system-generated events and user-defined events.

There is only one type of system-generated manual events, Activity Area Good Part Count - Manual, and only one event of this type may exist in a workcell.

Manual events can be created only in an activity area configured as a manual activity area. For more information on configuring manual activity areas, refer to Configure FactoryTalk Metrics Data Collection Parameters in the Configuration Console online help.

To configure an event as a manual event, select the **Manual Event** checkbox in the **Configure Performance Parameters Events** dialog box.



Configuring an event as a manual event influences the following settings:

- The Part Count performance parameter in the **Configure Performance Parameters** dialog box.
- The following performance parameters in the **Configure Performance Parameters Event** dialog box:
 - Event Trigger types.
 - Event Value.

The system-generated manual event is automatically described as manual in the **Categories & Events** list.



For user-defined manual events, you can enter additional information about manual configuration in the event name.

The properties of manual events are the same as the [user-defined events on page 49](#).

For more information on manual events, refer to Manual Events in the Configuration Console online help.

The recycle bin

The recycle bin is a system-generated category similar to the categories for available or running events. It is used to hold events that are no longer used to collect performance parameter data, but still have historical data in the database that may be used in reports. The recycle bin is only displayed in the **Performance Parameters Events** tree if historical data exists.

When you modify a set of performance parameters, FactoryTalk Metrics disables the existing events for the modified set, and creates events for the category. Then it checks if any data has been logged for the disabled events. If no data has been logged, the events are deleted. If there is some historical data for the event, the event is moved to the recycle bin.

For example, if you changed the activity area availability from **Data Point** to **Formula**, the system would disable the existing events in the Available category, delete the events that do not have historical data, move the events that have historical data to the recycle bin, and then create new available events.

NOTE: If you delete an event from the recycle bin, the event and any historical data associated with it will be deleted.

Configure user-defined events

The process of creating performance parameter events consists of the following stages:

1. [Configure the event data summary on page 51](#).
2. [Configure the event trigger on page 54](#).
3. [Configure the event value on page 58](#).
4. [Configure the machine state on page 67](#).
5. [Configure the reporting on page 68](#).

Configure the event data summary

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, under **Custom**, click **Events**.
In the right pane of the dialog box, a list of available categories and events appears.
5. Click **New**.
The **Configure Performance Parameter Event** dialog box appears.

To configure the event data summary:

1. In the **Description** box, type a name for the event.
2. In the **Category** list, either select a category from the list, or create a new one.

To create a new category:

- a. Next to the **Category** list, click **New**.
The **New Event Category** dialog box appears.
 - b. Under **Enter Event Category Name**, type a name for the new category.
 - c. Click **OK**.
3. In the **Data Summarization Type** list, select one of the following summarization types:
 - o Scheduled Shift Start
 - o Scheduled Shift Start and End
 - o Any Scheduled Shift Change
 - o Summarization Criteria Change
 - o Scheduled Shift Start or Summarization Criteria Change
 - o Scheduled Shift Start and End or Summarization Criteria Change
 - o Any Scheduled Shift Change or Summarization Criteria Change
 - o Performance Trending Summarization
 - o No Summarization



Tip: For information on individual data summarization types, see [Event data summarization types on page 52](#).

4. Continue with [Configure the event trigger on page 54](#).

Event data summarization types

Event data summarization defines how FactoryTalk Metrics will handle the creation of multiple summary records in the database for a single occurrence of an event.

There are the following event data summarization types:

Use this data summarization type:	To:
Scheduled Shift Start	Summarize the event data at the beginning of each shift defined in the schedule that was selected as a part of the Performance Parameters configuration. If no schedule was selected, a new shift is created at midnight of each day.
Scheduled Shift Start and End	Summarize the event data at the beginning of each shift. Shifts may not be configured continuously and there may be gaps of time between the end of a shift and the start of the next shift. This time is known as Out of Shift time. The event data will also be summarized at the end of any shift that is followed by Out of Shift time.
Any Scheduled Shift Change	Summarize the event data when transitions from available to unavailable time within a shift happen. The event data will be

Use this data summarization type:	To:
	summarized when these transitions happen as well as at the start of a shift and at the end of a shift that is followed by Out of Shift time.
Summarization Criteria Change	Summarize the event data when there is a change in any Summarization Criteria, Part Id, or Cycle Time that is being monitored for a Performance Parameters configuration. If there are no Summarization Criteria, Part Id or Cycle Time being monitored as a part of the Performance Parameters configuration then no Data Summarization will occur for the event.
Scheduled Shift Start or Summarization Criteria Change	Summarize the event data at the beginning of each shift as well as when there is a change in any Summarization Criteria, Part Id, or Cycle Time that is being monitored for the Performance Parameters configuration. This data summarization type is a combination of the Scheduled Shift Start and Summarization Criteria Change types.
Scheduled Shift Start and End or Summarization Criteria Change	Summarize the event data at the beginning of each shift, at the end of each shift that is followed by Out of Shift time, and when there is a change in any Summarization Criteria, Part Id, or Cycle Time that is being monitored for the Performance Parameters configuration. This data summarization type is a combination of the Scheduled Shift Start and End and Summarization Criteria Change types.
Any Scheduled Shift Change or Summarization Criteria Change	Summarize the event data at the beginning of each shift, at the end of each shift that is followed by Out of Shift time, when there is a change of Available states within a shift, and when there is a change in any Summarization Criteria, Part Id, or Cycle Time that is being monitored for the Performance Parameters configuration. This data summarization type is a combination of the Any Scheduled Shift Change and Summarization Criteria Change types.
Performance Trending Summarization	Summarize the historical data for Performance Parameters at regular intervals specified by the Performance Data Trending Rate, on any change of Shift or Available states within a shift, as well as when a change in any Summarization Criteria, Part Id, or Cycle Time data occurs. The event data will be summarized at the same time that the Performance Parameters data is summarized.
No Summarization	Choose not to summarize the event data at any time. The event will have one record for its entire duration.

Use this data summarization type:	To:
	Note: Use this data summarization type with caution because using it could result in creating event records that would make reporting less accurate.

Configure the event trigger

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, under **Custom**, click **Events**.
In the right pane of the dialog box, a list of available categories and events appears.
5. Click **New**.
The **Configure Performance Parameter Event** dialog box appears.

To configure the event trigger:

1. In the left pane of the dialog box, click **Event Trigger**.
2. In the **Event Trigger Type** list, select one of the following:
 - Monitored Bit Low to High Transition
 - Monitored Bit High to Low Transition
 - Monitored Value
 - Monitored Formula Low to High Transition
 - Monitored Formula High to Low Transition
 - Monitored Periodic Value
 - None



Tip: For information on the event trigger types, see [System-generated and user-defined event triggers on page 56](#).

The following steps will differ depending on the event trigger type that you have selected.

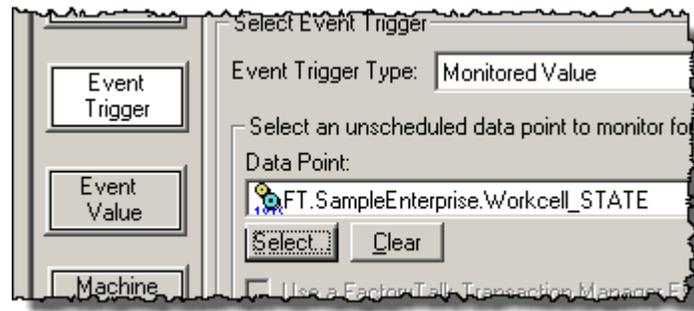
If you have selected any of these event trigger types:

- Monitored Bit Low to High Transition
- Monitored Bit High to Low Transition
- Monitored Value

Select a data point:

- a. Under **Data Point**, click **Select**.
The **Select Data Point** dialog box appears.
- b. Under **Data Points**, select a data point, and then click **Select**.

The data point that you have selected appears in the **Data Point** box.



- c. Continue with [Configure the event value on page 58](#).

If you have selected any of these event trigger types:

- Monitored Formula Low to High Transition
- Monitored Formula High to Low Transition

Create a formula:

- a. Under **Configure a Formula for the Event Trigger**, click **Edit**.

The **Formula Parts** dialog box appears.

- b. Follow the steps described in [Configure a formula on page 34](#), and define your formula.
 c. Continue with [Configure the event value on page 58](#).

If you have selected any of these event trigger types:

- Monitored Periodic Value
- None

Continue with [Configure the event value on page 58](#).

Event trigger types

There are the following types of event triggers:

[System-generated event triggers on page 55](#)

[System-generated and user-defined event triggers on page 56](#)

[Manual event triggers on page 57](#)

System-generated event triggers

The following event trigger types are available for system-generated events only:

This event trigger:	Is used by:
Activity Area Overall Available	<ul style="list-style-type: none"> • Overall Available Event
Activity Area Schedule	<ul style="list-style-type: none"> • Schedule Available Event
Activity Area Schedule Exception Unavailable	<ul style="list-style-type: none"> • Schedule Exception Unavailable Event
Activity Area Exception Unavailable	<ul style="list-style-type: none"> • Activity Area Exception Unavailable Event
Activity Area Available	<ul style="list-style-type: none"> • Activity Area Available - Point Event • Activity Area Available - Formula Event
Activity Area Running	<ul style="list-style-type: none"> • Activity Area Running - Point Event • Activity Area Running - Formula Event

The system-generated events cannot be edited by users.

System and user event triggers

The following event trigger types are available for system-generated events and user-defined events that are not manual:

Use this event trigger type:	To:
Monitored Bit Low to High Transition	<p>Monitor a bit value in the control system.</p> <p>For this event trigger type, you must specify a control system value as the trigger data point.</p> <p>The trigger data point does not have to be a bit but it must be numeric. Because this event is triggered by a change in the value reported by the control system, only values that report their data in an unscheduled manner may be selected as the trigger data point. The values that are collected and interpreted in a binary fashion with a value of zero being Low or Off and a nonzero value being High or On.</p> <p>Use the trigger to track a value whose natural state is Low and you want to activate the event when the value goes High and deactivate the event when the value returns to Low.</p> <p>This event trigger type will accumulate the amount of time that the control system value is in a High state.</p>
Monitored Bit High to Low Transition	<p>Monitor a bit value in the control system.</p> <p>For this event trigger type, you must specify a control system value as the trigger data point.</p> <p>The trigger data point does not have to be a bit but it must be numeric. Because this event is triggered by a change in the value reported by the control system only values that report their data in an unscheduled manner may be selected as the trigger data point. The values that are collected are interpreted in a binary fashion with a value of zero being Low or Off and a nonzero value being High or On.</p> <p>Use the trigger to track a value whose natural state is High and you want to activate the event when the value goes Low and deactivate the event when the value returns to High.</p> <p>This event trigger type will accumulate the amount of time that the control system value is in a Low state.</p>
Monitored Value	<p>Monitor any change of a value in the control system.</p> <p>For this event trigger type, you must specify a control system value as the trigger data point for this event trigger type.</p> <p>The trigger data point can be either a numeric or string data type. Because this event is triggered by a change in the value reported by the control system only values that report their data in an unscheduled manner may be selected as the trigger data point.</p>

Use this event trigger type:	To:
	<p>Use the trigger to track any change in the monitored value and accumulate the amount of time that a specific value is reported from the control system.</p> <p>This event trigger type is useful for tracking things such as machine states that do not have a specific On/Off value.</p>
Monitored Formula Bit Low to High Transition	<p>Monitor a result of a formula in the control system.</p> <p>Formulas let you perform advanced calculations that can be based on operations against multiple data points.</p> <p>See also: Monitored Bit Low to High Transition</p>
Monitored Formula Bit High to Low Transition	<p>Monitor a result of a formula in the control system.</p> <p>Formulas let you perform advanced calculations that can be based on operations against multiple data points.</p> <p>See also: Monitored Bit High to Low Transition</p>
Monitored Periodic Value	<p>Periodically collect a control system value.</p> <p>For this event trigger type, you do not select any control system value as a Trigger data point.</p> <p>This event trigger type is especially useful for collecting counter values to be associated with Performance Parameter data. It is used by the Activity Area Part Count - Point and Part Count Formula Point <Data Point Name> Events. It causes the control system value selected for the event value data point to be collected from the control system every five seconds.</p> <p>The event trigger type does not cause new event data records to be written to the database. The event data will only be written to the database according to the Data Summarization type selected for the event.</p>
None	<p>Periodically collect a control system value.</p> <p>For this event trigger type, you do not select any control system value as a Trigger data point.</p> <p>This event trigger type is especially useful for collecting physical parameter data over the duration of a period of data collection. It causes the control system value selected for the event value data point to be collected and written to the database every 5 seconds for the duration of data collection.</p> <p>Important: This event trigger type will generate an large amount of data when compared to other event trigger types.</p>

Manual event triggers

There are the following event trigger types available for manual events:

Event trigger type	Description
Manual active/inactive event	<p>The behavior of this trigger type is similar to the following trigger types available for user-defined events:</p> <ul style="list-style-type: none"> • Monitored Bit Low to High Transition • Monitored Bit High to Low Transition • Monitored Formula Low to High Transition • Monitored Formula High to Low Transition <p>The difference between those trigger types and the Manual active/inactive event trigger type is that the latter does not require a data point attached to it.</p>
Manual monitored continuous event	<p>The behavior of this trigger type is similar to the Monitored Value trigger type available for user-defined events.</p> <p>The difference between those trigger types is that the Manual monitored continuous event trigger type does not require a data point attached to it.</p>

Configure the event value

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, under **Custom**, click **Events**.
In the right pane of the dialog box, a list of available categories and events appears.
5. Click **New**.
The **Configure Performance Parameter Event** dialog box appears.

To configure the event value:

1. In the left pane of the dialog box, click **Event Value**.
2. In the **Event Value Type** list, select one of the following:
 - Collect Value at the Start of the Event
 - Collect Value at the End of the Event
 - Collect Value at the Start and the End of the Event
 - Accumulate Value for the Duration of the Event
 - None



Tip: For information on individual event value types, see [Event value types on page 59](#).

The following steps will differ depending on the event value type that you have selected.

If you have selected any of these event value types:

- Collect Value at the Start of the Event
- Collect Value at the End of the Event

- Collect Value at the Start and the End of the Event
- Accumulate Value for the Duration of the Event

Choose either of the following:

- Select a data point for the Event Value
 - a. Under **Data Point**, click **Select**.
The **Select Data Point** dialog box appears.
 - b. Under **Data Points**, select a data point, and then click **Select**.
The data point that you have selected appears in the **Data Point** box.
 - Configure a FactoryTalk Transaction Manager Expression for the Event Value
 - a. Under **Expression**, click **Edit**.
The **Expression Editor** dialog box appears.
 - b. Follow the steps described in [Use the expression editor on page 62](#), and define your expression.
3. Select or create an Event Value/Reason Code Lookup List, if you have selected any of these event value types:
- Collect Value at the Start of the Event
 - Collect Value at the End of the Event
 - Collect Value at the Start and the End of the Event

With the lookup list you can provide descriptive names for your event values:

Under **Event Value/Reason Code Lookup List**, select an existing lookup list for your event value.

- To edit the list, click **Edit List**.
The **Lookup Code Configuration** dialog box appears.
- To create a list, click **Create List**.
The **Lookup Code Configuration** dialog box appears.



Tip: See [Create event value lookup lists on page 66](#) for details.

4. Continue with [configuring the machine state on page 67](#).

Event value types

The historical event data contains fields to record an initial value and an ending value for an event. The Event Value type defines which of these fields is used as well as what is stored there.

There are the following event value types:

Event value type	Description	This event value type is available for:
Plant Model Unit Part Count	Sets the initial value of the event to be zero and the ending value of the event to be the accumulated Part Count for the duration of the event.	System-generated events
Collect Value at the Start of the Event	Collects a value when the Event Trigger is activated. No value is collected at the end of the Event Trigger and the ending value field is ignored for this event. Use this Event Value type when you are only interested in the data that	<ul style="list-style-type: none"> • System-generated events • User-defined events • Manual events

Event value type	Description	This event value type is available for:
	<p>will be collected when the Event Trigger is activated. For example, an event that uses the Monitored Value Event Trigger type and is supposed to associate time-in-state information with the additional Event Value data would only use the initial collected value because the ending collected value would be the same as the initial collected value of the next historical event data record.</p> <p>If you select this Event Value type, you should select a device scheduled data point OR the same data point used to trigger the event. If a Scheduled data point is used, there is no guarantee that the value collected when the event is triggered is current.</p> <p>You may select a Value Lookup list to associate descriptive string values with collected numeric codes.</p>	
Collect Value at the End of the Event	<p>Collects a value at the termination of an event. No value is collected when the event is activated and the initial value field is ignored for this event.</p> <p>Use this Event Value type when you are only interested in the data that will be collected at the termination of the Event Trigger. For example, if an event is triggered by a machine breakdown and the operator enters a reason code for the breakdown and resets the trigger bit, the Event Value is only available to be collected when the event ends.</p> <p>You may select a Value Lookup list to associate descriptive string values with collected numeric codes.</p>	<ul style="list-style-type: none"> • System-generated events • User-defined events • Manual events
Collect Value at the Start and End of the Event	<p>Collects a value when the event is activated and when it is ended. The initial and ending value fields are both used by this type of event. Use this Event Value type when you are interested in the data that will be collected when the Event Trigger is activated and at the termination of the Event Trigger.</p>	<ul style="list-style-type: none"> • System-generated events • User-defined events • Manual events

Event value type	Description	This event value type is available for:
	<p>This Event Value type is used by the system-generated events that monitor Part Count information.</p> <p>You may select a Value Lookup list to associate descriptive string values with collected numeric codes.</p>	
Accumulate Value for the Duration of the Event	<p>Accumulates the differences between the values that it collects and stores them in the starting and ending value fields. The starting value field will always be set to zero for this Event Value type. The ending value will be calculated by accumulating the differences between values received for the duration of the event. This Event Value type is most useful when used with the Monitored Periodic Value Event Trigger type. This Event Value type is designed to store counter data in situations when the user does not care about the starting and ending values but only how much the value has changed.</p> <p>You cannot select a Value Lookup list for this Event Value type.</p>	<ul style="list-style-type: none"> • System-generated events • User-defined events • Manual events
None	<p>Disables the collection of Event Value data. It is used for an event where no additional data is associated with the condition that caused the Event Trigger to activate. For example, an event that is being used to track when a certain bit value is set to On might not need to collect additional Event Value data.</p> <p>This Event Value type does not use an Event Value data point or Event Value FactoryTalk Transaction Manager expression, or a Value Lookup list.</p>	<ul style="list-style-type: none"> • System-generated events • User-defined events • Manual events

NOTE: Event value types available for user-defined events are also available for manual events. The difference between them is that event values for manual events are not collected from a data point attached to the event.

For manual events, a numeric value or a string value can be configured in the **Specify a default Value for this Event** box.

You cannot use a comma for a string value of a manual event.

Use the expression editor

The Expression Editor is a FactoryTalk Transaction Manager tool that you can use to create expressions, the result of which can be passed to a column in a database table or a parameter in a stored procedure in a database. After all data has been collected, expressions are evaluated. If the data points cannot be collected in the defined time period (data retrieval), the selected data point substitution policy determines the value that is used in the expression.

The following operations and functions are available in the Expression Editor:

- [Logical and mathematical operations on page 62.](#)
- [Time format and processing functions on page 62.](#)
- [Data point functions on page 64.](#)
- [Advanced functions on page 65.](#)

Logical and mathematical operations

Use the mathematical operators listed in the following table to perform calculations in defining an expression string. Once an expression has been defined, the syntax and semantics are checked to determine if it can be evaluated at run time. The results are then passed to the enterprise connector for storage.

Arithmetic	Bitwise	Logical
+ (addition)	& (AND)	> (greater than)
- (subtraction)	(inclusive OR)	< (less than)
% (modulus)	^ (exclusive OR)	>= (greater than or equal to)
* (multiplication)	>> (right shift)	<= (less than or equal to)
/ (division)	<< (left shift)	== (equal to)
\ (integer division)		!= (not equal to)
((left parenthesis)		&& (logical AND)
) (right parenthesis)		(logical OR)

Time format and functions

Use the following time format and processing functions:

Item	Description
UTC	Specifies that a timestamp will be displayed in Coordinated Universal Time (UTC) format. This format can be attributed to the TransTimestamp(), the TimestampOf(), and OPCTimestampOf() functions. The letters 'UTC' will be appended to all expressions. Example: <code>TransTimestamp (Datapoint1, "UTC")</code>
Local	Specifies that a timestamp will be displayed in the local time format (default). This time format can be attributed to the

Item	Description
	<p>TransTimestamp(), the TimestampOf(), and OPCTimestampOf() functions. The word 'Local' will be appended to all expressions.</p> <p>Example:</p> <pre>TransTimestamp (Datapoint1, "Local")</pre> <p>Tip: The FactoryTalk Transaction Manager service will correctly format the UTC-based times; the FactoryTalk Transaction Manager service will accept the UTC-based format, but it will not evaluate times to the UTC formats. All time expressions will be resolved to system local time.</p>
TimestampOf()	<p>Uses a single data point as a parameter to return a timestamp value that indicates when the control connector received this data point. This value is accurate to the nearest second.</p>
MTimestampOf()	<p>Uses a single data point as a parameter to return the millisecond component of the TimestampOf() function. This value is an integer between 0 milliseconds and 999 milliseconds.</p> <p>Tip: The TimestampOf() and MTimestampOf() functions can also be considered data point functions.</p>
OPCTimestampOf()	<p>Uses a single data point as a parameter to return an OPC timestamp value that indicates when the OPC data server (or FactoryTalk data server) received (or read) the data from the controller. If the data server is RSLinx[®] Classic, this is the time when RSLinx Classic provided data to FactoryTalk Transaction Manager. If the data server is FactoryTalk[®] Linx[™], this is the time when FactoryTalk Linx acquired the data from the controller. This value is accurate to the nearest second.</p>
MOPCTimestampOf()	<p>Uses a single data point as a parameter to return the millisecond component of the OPCTimestampOf() function. This value is an integer between 0 milliseconds and 999 milliseconds.</p> <p>Tips:</p> <ul style="list-style-type: none"> The Transaction Control Manager will correctly evaluate the time as it was received from the OPC or FactoryTalk[®] Live Data server. The FactoryTalk Transaction Manager will substitute the TimestampOf() or MTimestampOf() functions for the OPCTimestampOf() or MOPCTimestampOf() functions. Any OPC time is returned to the Transaction Control Manager service as an UTC-formatted time. If you specify the local format, then the time is converted based on the local time of the Transaction Control Manager service, not the local time on the OPC or FactoryTalk Live Data server.

Item	Description
TransTimestamp()	Returns a timestamp value that indicates when the transaction occurred. This value is accurate to the nearest second.
MTransTimestamp()	Returns the millisecond component of the TransTimestamp() function. This value is an integer between 0 milliseconds and 999 milliseconds.

Data point functions

An expression can contain a range of values that it can use to calculate an average of the previous 10 transaction values (avg (datapoint [0:9])). This functionality also works to calculate the minimum (min) or maximum (max) value of a data point over several transactions. The transaction must be run to reflect changes in the historical values. The results, however, do not need to be stored. Using the Store on Every N Transactions option, you can collect the data needed for an average, but not store the data to the database. If a transaction executes every second, but only stores its data every 60 times and there is an avg (datapoint [0:59]), the value that is stored once a minute is the average of the values collected every second.

Use the following data point functions:

Item	Description
SUM()	Returns the sum of multiple parameters for data points, ranges, numbers, or numeric expressions.
DIFF()	Uses two parameters to return the difference between the previous value and the current value. The first parameter is a data point, usually a counter accumulator. The second parameter is a rollover value and is used when the current value is less than the previous value. This function has built in rollover logic used when the current value is less than the previous value. This logic calculates the difference between the rollover value and the previous value and adds the current value. <ul style="list-style-type: none"> If current value > previous value, then Diff = (current value - previous value) If current value < previous value, then Diff = (rollover value - previous value) + current value
AVG()	Returns the average of multiple parameters for data points, ranges, numbers, or numeric expressions.
MIN()	Returns the minimum value of multiple parameters for data points, ranges, numbers, or numeric expressions.
MAX()	Returns the maximum value of multiple parameters for data points, ranges, numbers, or numeric expressions.
NameOf()	Returns a string that contains the name of a single data point as a parameter.
ItemOf()	Returns a string that contains the item or tag name of a single data point as a parameter.

Item	Description										
QualityOf()	<p>Uses one parameter to return three OPC server values. The values in parentheses in the first column of the following table represent the OPC bit values for quality. The corresponding converted QualityOf() return values are displayed in the second column. This function only applies to OPC or FactoryTalk data servers.</p> <table border="1" data-bbox="1036 407 1497 653"> <thead> <tr> <th data-bbox="1036 407 1281 449">OPC Server</th> <th data-bbox="1281 407 1497 449">QualityOf()</th> </tr> </thead> <tbody> <tr> <td data-bbox="1036 449 1281 491">Bad (0)</td> <td data-bbox="1281 449 1497 491">1</td> </tr> <tr> <td data-bbox="1036 491 1281 533">Uncertain (1)</td> <td data-bbox="1281 491 1497 533">2</td> </tr> <tr> <td data-bbox="1036 533 1281 575">N/A (2)</td> <td data-bbox="1281 533 1497 575">3</td> </tr> <tr> <td data-bbox="1036 575 1281 617">Good (3)</td> <td data-bbox="1281 575 1497 617">0</td> </tr> </tbody> </table> <p>If you use the Use Bad Quality option and you have chosen the QualityOf() expression string from the Expression Editor dialog box, along with the Substitute Previous Value option, the FactoryTalk Live Data server sends bad quality data to the control connector. The control connector logs the bad quality and passes it to the Transaction Manager service. The Transaction Manager service substitutes the previous data point's value, as well as the QualityOf() the previous data point's value, and then passes good quality to the enterprise connector. The enterprise connector then logs good quality.</p> <p>If you use the Use Bad Quality option and you have chosen the QualityOf() expression string from the Expression Editor dialog box, along with the Substitute Value option, the FactoryTalk Live Data server sends bad quality to the control connector. The control connector logs the bad quality and passes it to the Transaction Manager service. The Transaction Manager service uses the specified substitute value, and then passes good quality to the enterprise connector. The enterprise connector then logs good quality.</p>	OPC Server	QualityOf()	Bad (0)	1	Uncertain (1)	2	N/A (2)	3	Good (3)	0
OPC Server	QualityOf()										
Bad (0)	1										
Uncertain (1)	2										
N/A (2)	3										
Good (3)	0										

Advanced functions

Use the following advanced functions:

Item	Description
Parse()	<p>The Parse function uses four parameters to return the requested value from a data point array.</p> <ul style="list-style-type: none"> The first parameter is the data point to parse. The data point is usually created as a starting data table address and a length, for example, N7:0,L8 returns an array of eight elements from N7:0 to N7:7 in one data point.

Item	Description
	<ul style="list-style-type: none"> • The second parameter is the starting offset in the bytes of data to be extracted from the array. • The third parameter is the length in the bytes of data to be extracted. • The fourth parameter is the data type of the extracted data. Data extracted from the data point array is converted to this data type. <p>The Expression Editor supports a data point range syntax that compares a data point value over a series of transactions. Each time the transaction runs, a new value is added to the data range for a given transaction. The expression is then evaluated using the range of values.</p>
Data Point Range	<p>The MIN(), MAX(), SUM(), and AVG() functions use the data point range for multiple parameters of historic data from a single data point. Transactions using the Data Point Range expression fail until there is enough historical data to evaluate the expression.</p> <p>For example, the expression AVG(data_point[0:4]) computes the average of the current value of temperature plus the previous four historical values of temperature. The first four occurrences fail because historical data is not available. Error 32769 is returned (invalid argument passed to a function).</p>

Create event value lookup lists

How do I access the dialog box?

1. In the left pane of the **Configure Performance Parameter Event** dialog box, click **Event Value**.
2. Under **Event Value / Reason Code Lookup List**, click **Create List**.
The **Lookup Code Configuration** dialog box appears.

To configure an Event Value/Reason Code lookup list

1. In the **Lookup Code Description** box, type a name for the Event Value Reason Code lookup list.
2. Under **Lookup Code Values**, click **Add**.
The **Lookup Code Value** dialog box appears.
3. In the **Value** box, type a value.
4. In the **Description** box, type a description of the value.
5. Under **Severity Level**, select either of the following:
 - **Do not record a Severity Level for this Lookup Code Value**
This is the default setting.
 - **Specify a Severity Level for this Lookup Code Value**
Type a value between 0 (high severity) and 100 (low severity) that will be used to determine how serious the event is when this lookup code value is collected.
6. Select any of the following:

- Click **OK**.

The value appears under **Lookup Code Values**.

See the following table for the structure of the .csv file.

This item:	Is data of type:
Lookup Value	Numeric
Description	String
Fault State	Boolean: <ul style="list-style-type: none"> 1, 0, or true, false (case-insensitive).
Severity	Numeric: <ul style="list-style-type: none"> -1 (to indicate no severity), or Between 0 (high severity) and 100 (low severity).
Normal State	Boolean: <ul style="list-style-type: none"> 1, 0, or true, false (case-insensitive).

Instead of manually configuring a lookup code list, you can import an existing list from a comma-separated values file (.csv).

NOTE: If a Shift Description lookup list already contains values, and you intend to import other values to this list, the original values will be replaced with the new ones.

To import Event Value Reason Code lookup list values:

- Under **Previous Import File Path**, click **Import**.
The **Open** dialog box appears.
- Select a file that contains the lookup list, and then click **Open**.
- Click **OK**.

Configure the machine state

How do I access the dialog box?

- On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
- Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
- If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
- In the left pane of the dialog box, under **Custom**, click **Events**.
In the right pane of the dialog box, a list of available categories and events appears.
- Click **New**.
The **Configure Performance Parameter Event** dialog box appears.

To configure fault metric tracking and machine states:

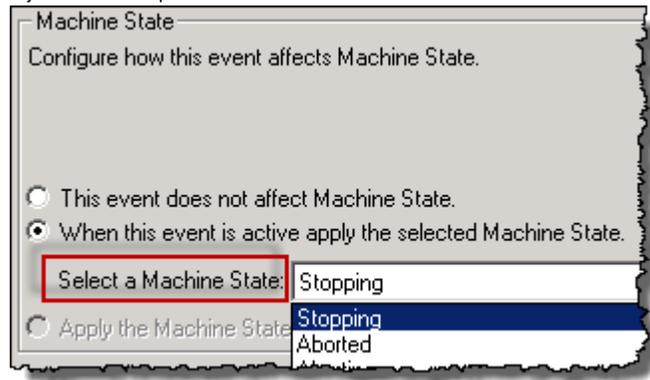
1. In the left pane of the dialog box, click **Machine State/Faults**.
2. Under **Fault Metric Tracking**, select one of the following:
 - This event is not used in calculating Fault Metrics.
 - This event represents a Fault for the purposes of calculating Fault Metrics.
 - This event's collected value is used to calculate Fault Metrics based on the Event Lookup Code List. The availability of the options depends on the event trigger that you selected in [Configure the event trigger on page 54](#), and on whether you have selected the [manual event on page 50](#) option for the particular event.



Tip: See [manual events on page 50](#) for details.

3. Under **Machine State**, select one of the following:
 - This event does not affect Machine State.
 - When this event is active, apply the selected Machine State.

If you select this option, select also a machine state from the list.



To edit the state, click **Edit States**.
 The **Configuring Machine States** dialog box appears.



Tip: See [Configure the machine states on page 74](#) for details.

- Apply the Machine State configure for the event's collected value in the Event Lookup Code List. The availability of the options depends on the event trigger that you selected in [Configure the event trigger on page 54](#), and on whether you have selected the **Manual Event** option for the particular event.
4. Continue with [configuring the reporting on page 68](#).

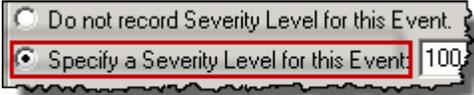
Configure the reporting

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
 The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
 The **Configure Performance Parameters** dialog box appears.

3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, under **Custom**, click **Events**.
In the right pane of the dialog box, a list of available categories and events appears.
5. Click **New**.
The **Configure Performance Parameter Event** dialog box appears.

To configure the reporting:

1. In the left pane of the dialog box, click **Reporting**.
2. Under **Reporting Value**, you may need to choose the value that will be used for the reporting purposes for the event.
You will need to select the reporting value, if you have selected the **Collect Value at the Start and the End of the Event** option in [Configuring the event value on page 58](#).
3. Under **Event Severity Level**, select one of the following options:
 - Do not record Severity Level for this Event.
 - Specify a Severity Level for this Event.
If you select this option, you will need also to set the severity level for the event from the following range: 0 = very severe, 100 = not severe.

 - Use the Severity Level from the selected Event Lookup Code List for the collected event value.
This option is available if you selected an Event Value/Reason Code Lookup List in [Configure the event value on page 58](#).
If the event is collecting a value at the start of the event, at the end of the event, or at the start and end of the event and if the event is using a lookup list to provide a description of the event value, you may choose to collect event severity also from the lookup list. The severity levels that have been associated with the values in the selected lookup list will be used when recording the severity for this event.
4. Under **Additional Reporting Properties**, select the **Exclude this event from the OEE Box report Machine Event list** option, if you do not want this event to be displayed in the OEE Box report.
5. Click **OK**.

Advanced properties

How do I access the dialog box?

1. On the **Configure** menu, click **FactoryTalk Metrics > Performance Parameters**.
The **Manage Performance Parameters** dialog box appears.
2. Select the activity area for which you want to associate machine states, and then click **Configure**.
The **Configure Performance Parameters** dialog box appears.
3. If necessary, select the FactoryTalk Transaction Manager configuration for the activity area.
4. In the left pane of the dialog box, under **Custom**, click **Advanced**.

You can configure the following features for the current activity area:

- [Scheduled part count collection parameters on page 70](#).
- [System-generated event data summarization on page 70](#).

- [Availability interpretation options on page 71.](#)
- [Performance data trending rate on page 71.](#)

Part count collection parameters

Under **Scheduled Part Count Collection Parameters**, specify how part count data will be collected from the control system when using a scheduled data point for a part counter.



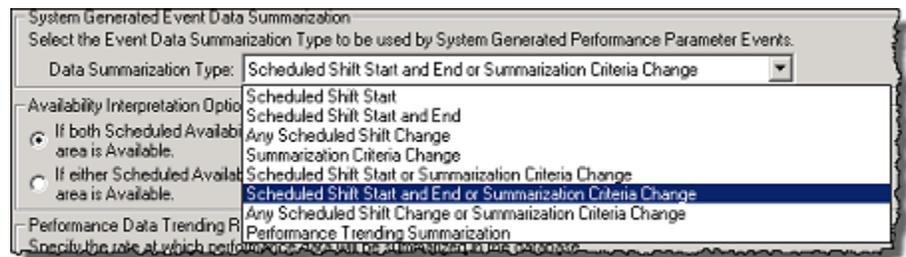
You can set the collection rate in the range of 1 to 60 seconds. This setting does not affect unscheduled part counters, which are collected as often as they change.

When configuring the setting, consider the following:

- The lower the number, the more often the data will be collected from the control system. Using a lower number enables a greater resolution in data collected from rapid processes. The part counts will be stored in a record that spans 10 minutes (by default), so a higher resolution in collecting the part count data does not translate into a higher resolution for reporting.
- The greater the number, the less often the data will be collected. Using a higher number can help with server loading in slower processes. The downside is that collecting part counts infrequently can lead to count inaccuracies when, for example, part count registers are reset.

System event data summarization

Under **System Generated Event Data Summarization**, select the data summarization type that will be used by system-generated events. The summarization behavior of custom events is defined for each event.

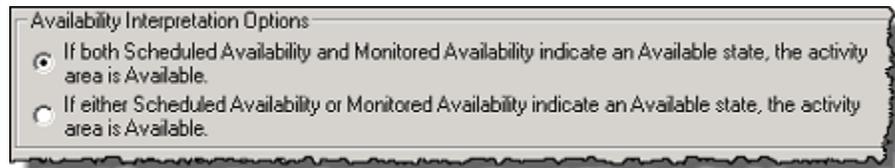


The following data summarization types are available:

- Scheduled Shift Start
- Scheduled Shift Start and End
- Any scheduled Shift Change
- Summarization Criteria Change
- Scheduled Shift Start or Summarization Criteria Change
- Scheduled Shift Start and End or Summarization Criteria Change
- Any scheduled Shift Change or Summarization Criteria Change
- Performance Trending Summarization

Availability interpretation options

Under **Availability Interpretation Options**, specify how FactoryTalk Metrics should determine the overall availability. Availability is determined by evaluating the [scheduled availability on page 37](#) and the [monitored availability on page 42](#).



Select either of the following options:

- **If both Scheduled Availability and Monitored Availability indicate an Available state, the activity area is Available.**

When you select this option, the Metrics Server Manager calculates availability in the most restrictive way. It means that the Scheduled Availability and the Monitored Availability must both evaluate to available for the activity area to be considered overall available.

This is the default setting.

- **If either Scheduled Availability or Monitored Availability indicate an Available state, the activity area is Available.**

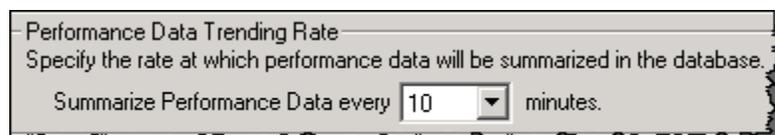
When you select this option, the Metrics Server Manager calculates availability in the least restrictive way. It means that either the Scheduled Availability or the Monitored Availability must evaluate to available for the activity area to be considered overall available.

The following table lists the results of the Boolean AND and OR operations:

Scheduled Availability	Monitored Availability	AND Result	OR Result
Available	Available	Available	Available
Available	Not Available	Not Available	Available
Not Available	Available	Not Available	Available
Not Available	Not Available	Not Available	Not Available

Performance data trending rate

Under **Performance Data Trending Rate**, specify the interval at which workcell history records will be written to the database.



By default the rate is 10 minutes, so there will be one new record inserted in the workcell history table for each active activity area every 10 minutes (unless some other summarization events have occurred that would create additional records). Setting the interval to a higher number will result in fewer records in the database, each of them spanning a longer time.

Machine states

Machine states are special attributes of user-defined events. While user-defined events are independent of each other (that is, at any time there may be no or many user-defined events active at a particular activity area), machine states are mutually exclusive. This means that an activity area can be in only one machine state at a time, and each activity area that has machine states configured is always in the machine state at all times.

The advantage of using machine states is that it is possible to account for all the time in the activity area by means of the defined machine states, without gaps and without double counting the time. If you do not use machine states, you need to implement a similar machine-state logic in the control system, if you want to collect the machine state information.

Machine states are defined for the FactoryTalk Metrics application as a whole (not for individual activity areas). Up to 99 unique machine states can be defined for a FactoryTalk Metrics application.

When you configure the performance parameters for an activity area, you can also configure the appropriate machine states for the activity area. Each activity area can be in only one machine state at a time, so all machine states should be mutually exclusive. All, some, or none of the defined machine states can be configured in a particular activity area.

Each machine state has a priority, so if multiple machine states could be active simultaneously, only the machine state with the highest priority would actually be active. If at any time the activity area is not in a defined machine state, the machine state will be logged as **Undefined**.

The following examples illustrate a possible approach to defining machine states, and how they can be configured for one sample activity area. The data used in the examples is not available in the sample databases.

Sample machine states

Let us assume that the machines and the activity areas of the Sample Enterprise that you created in [the plant model on page 12](#) can be in one of the following machine states at any particular time:

State	Description
Running	The machine is producing output. This state represents the ideal state for this machine because the machine is available and running.
Setup	The machine is being changed over for a new production run. This state represents a minor problem. In this state, the machine is available, but not running.
Test	The machine is in the test mode. This state represents a minor problem. In this state, the machine is neither available nor running.
Blocked	The machine is blocked because of a problem at a downstream machine. This state represents a major problem, but not a severe problem. In this state, the machine is available, but not running.

State	Description
Starved	The machine is starved for parts from an upstream machine. This state represents a major problem, but not a severe problem. In this state, the machine is available, but not running.
Linefault	The machine is simultaneously blocked because of a problem at a downstream machine and starved for parts from an upstream machine. This state represents a severe problem. In this state, the machine is available, but not running.
Down	The machine is unavailable for production for some reason other than the linefault, blocked, or starved state. This state represents a major problem, but not a severe problem. In this state, the machine is available, but not running.

For the sample workcell, the states are determined by collecting values from the following data points:

- **FT.SampleEnterprise.Workcell.STATE**

This monitored value data point can have one of the following values:

This value:	Maps to this machine state:
0 (running)	Running
1 (setup)	Setup
2 (test)	Test
3 (down)	Down
4 (off)	This value does not map to any particular machine state, so by default it maps to the <code>Undefined</code> machine state.

- **FT.SampleEnterprise.Workcell.BLOCKED**

When this monitored bit data point is on (1), the value maps to the **Blocked** machine state.

When this data point is on, the **FT.SampleEnterprise.Workcell.STATE** data point has the value of **Down (3)**.

- **FT.SampleEnterprise.Workcell.STARVED**

When this monitored bit data point is on (1), the value maps to the **Starved** machine state.

When this data point is on, the **FT.SampleEnterprise.Workcell.STATE** data point has the value of **Down (3)**.

- **FT.SampleEnterprise.Workcell.BLOCKED** and **FT.SampleEnterprise.Workcell.STARVED**

When both of these monitored bit data points are on, the combined value maps to the **Linefault** machine state.

NOTE: The data referred to in this and the following topics is for reference only. It is not shipped with the <RSB> suite.

Prioritize machine states

After you have defined your machine states, you must configure and prioritize them.

The priority of a machine state is used by FactoryTalk Metrics to select one machine state, if the values collected from one or more user-defined events would otherwise indicate that two or more machine states should be active. If there is a situation where the values of one or more user-defined events can map to more than one machine

state simultaneously, the priority is used to determine which machine state becomes active. In such a situation, the machine state with the highest priority (that is, the lowest priority number) is selected. If there is no overlap possible between machine states, their relative priority is unimportant.

In the Sample Enterprise, we would prioritize the machine states in the following order (from the highest priority to the lowest one):

1. **Linefault**

This state occurs when the data points for **Blocked** and **Starved** are on, so this state must have a higher priority than either of the other two states. If either **Blocked** or **Starved** had a higher priority than **Linefault**, the **Linefault** state would never occur.

2. **Blocked**

This state must have a higher priority than the **Down** state, because when a machine is blocked, it is also down, but when a machine is down, it is not necessarily blocked (it could be in the **Linefault** state, the **Starved** state, or some down condition that maps to the **Down** state).

The relative priority of **Blocked** and **Starved** to each other is unimportant, because when they are both active, the machine is in the **Linefault** machine state.

3. **Starved**

This state must have a higher priority than the **Down** state, because when a machine is starved, it is also down, but when a machine is down, it is not necessarily starved (it could be in the **Linefault** state, the **Blocked** state, or some down condition that maps to the **Down** state).

The relative priority of **Blocked** and **Starved** to each other is unimportant because when they are both active, the machine is in the **Linefault** machine state.

4. **Down**

The data point that maps to this state can indicate any type of down condition (including the **Linefault** state, the **Blocked** state, the **Starved** state, or any other generic down condition), so it must have the lowest priority of all of the down states.

The relative priority of the **Test**, **Setup**, and **Running** states is unimportant, because the values of the data points used to determine the states are mutually exclusive with each other and with the down states.

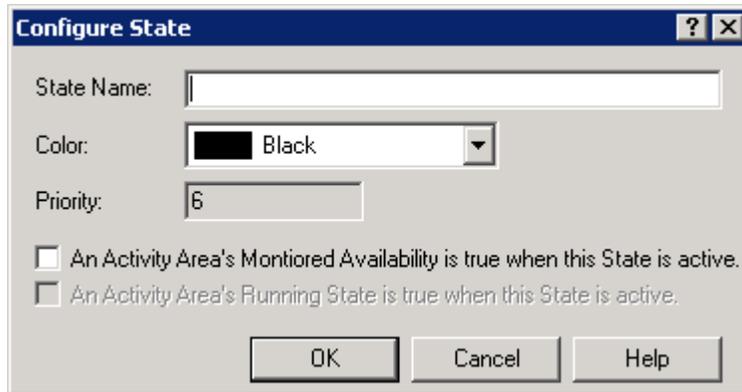
Configure machine states

In this tutorial, you will configure machine states for the Sample Enterprise.

To configure machine states:

1. On the **Configure** menu, click **FactoryTalk Metrics > Machine States**.
The **Configure Machine States** dialog box appears.
2. Click **Add**.

The **Configure State** dialog box appears. The dialog box is used to define the properties of an individual machine state.



3. In the **State Name** box, type a unique name for the state.
4. In the **Color** list, select the color that will be used to represent the state in graphical reports.

NOTE: The read-only **Priority** box indicates the priority of this machine state relative to other machine states. It is assigned automatically to the given machine state. You can change the priority using the **Priority** arrows in the **Configure Machine States** dialog box.

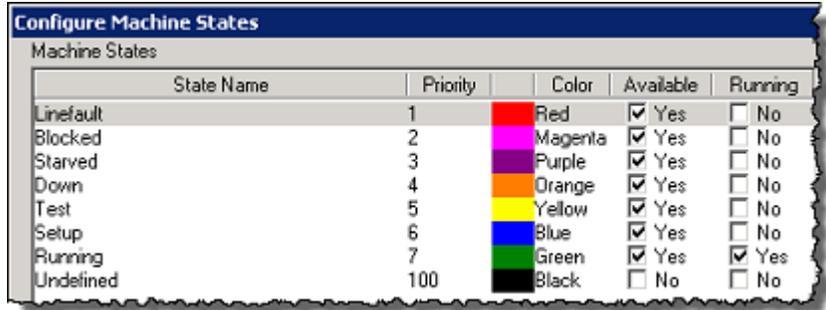
5. If necessary, select the following options:
 - **An Activity Area's Monitored Availability is true when this State is active**
With this option, the state will indicate that the machine is available for production.
 - **An Activity Area's Running State is true when this State is active**
You can select this option, provided that you have selected the first one.
With this option, the state will indicate that the machine is actually producing output.



6. Click **OK**.
7. Repeat steps 2-6 and add other machine states.

8. Under **Machines States**, use the **Priority** arrows to put the states in the correct order.

An example of the machine state configuration is presented in the following figure.



State Name	Priority	Color	Available	Running
Linefault	1	Red	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Blocked	2	Magenta	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Starved	3	Purple	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Down	4	Orange	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Test	5	Yellow	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Setup	6	Blue	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Running	7	Green	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes
Undefined	100	Black	<input type="checkbox"/> No	<input type="checkbox"/> No

Map machine states to events

After you have configured your machine states for the FactoryTalk Metrics application, you can map the relevant machine state to the user-defined events that are used to derive that machine state in each activity area.

The way the mapping is created depends on the types of event triggers that you use for the mapping.

Monitored value data points can return a range of valid values. Monitored value data points do not have on/off states, so each value they return can map to a different machine state. You do not have to map a value to a particular state though if that value has no meaning within your set of defined machine states.

To map a machine state to a particular performance event, use the **Machine State/Faults** tab in the **Configure Performance Parameter Event** dialog box.

For more information, see [Configure the machine state on page 67](#).

Availability and running state

You can use the fact that a machine state is active to determine if the corresponding activity area is available (monitored availability), running (running state), or both.

To determine the monitored availability or running state of the activity area by means of the activity area's machine state, perform one or both of the following:

- Use the machine state to determine the monitored availability.
To do so, use the **Monitored Availability** tab in the **Configure Performance Parameters** dialog box.
For more information, see [Configure monitored availability on page 42](#).
- Use the machine state to determine the running state.
To do so, use the **Running State** tab in the **Configure Performance Parameters** dialog box.
For more information, see [Configure running state on page 44](#).

Perform downtime tracking

Each FactoryTalk Metrics implementation may be different, but all of them endeavor to answer the question: "What are my machines doing?" To answer this question, you need to consider these two related questions: "Are my machines running when they are supposed to?" and "What are they doing when they are not running?" Downtime tracking can answer these questions for you.

The word "downtime" is frequently used, but may mean different things to different people. All of the following are possible definitions of downtime:

- Any time the machine is not running.
- Any on-shift time the machine is not running.
- Any on-shift time when predefined conditions cause the machine to stop (this excludes other conditions from downtime).
- Any on-shift time, except certain conditions (like blocked or starved) when predefined conditions cause the machine to stop.
- Any time the machine is in a predefined fault condition.

Further, when someone says they want to see downtime reports, they may want to see:

- All the time, divided into categories like running and downtime.
- All the downtime.
- The downtime divided into predefined categories.
- The downtime divided into predefined categories with reason codes entered by the operator.
- The downtime by machine, shift, part, operator, and so on.

It is important that you carefully consider the definition of downtime and the reporting requirements of your organization, before you start a downtime tracking project. In addition, there are three distinct approaches to downtime tracking with FactoryTalk Metrics that you should evaluate for your organization. Each approach has its own advantages and considerations:

- [Running versus downtime on page 77.](#)
- [User-defined downtime events on page 78.](#)
- [Machine state on page 78.](#)

Running versus downtime

This measure of downtime is suitable for the organizations that consider downtime to be "any time a machine is available to produce parts, but is not actually running".

By default, an activity area is assumed to be always available and always running; however, this default configuration does not allow you to collect downtime for the activity area. To collect downtime, you need to provide a method to determine the machine availability and a running indicator from the control system.

To define the monitored availability of an activity area, use the **Monitored Availability** tab in the **Configure Performance Parameters** dialog box.

You can set there the available time to be collected from the control system, or to be defined by a time pattern (or a shift schedule), and modified by the Monitored Availability setting. You can also define a data point or a formula from the control system that indicates when the monitored machine is running.

For more information, see [Configure monitored availability on page 42.](#)

To report on the difference between the available time and running time (that is, the time when the machine was available but not running), use the **Downtime Seconds** column in the PlantMetrics Workcell History report data source.

To report on running versus downtime data, use the **Running Percent** and **Downtime Percent** columns in the PlantMetrics Workcell Detail report data source.

For more information, see [Report data sources on page 110](#).

The advantage of using the method of downtime tracking is that very little configuration or control system data is required. The disadvantage of this method is that all the non-running time is lumped together, making it impossible to determine the downtime causes.

User-defined downtime events

The ability to configure user-defined events in FactoryTalk Metrics allows you to collect and report on virtually any event that happens on the factory floor, provided that the event can be detected by the control system. This is the most powerful capability of the product, and through it FactoryTalk Metrics can illuminate all sorts of conditions (for example, machine component behavior, setups and changeovers, quality checks).

With user-defined events, downtime can be tracked to the lowest level of detail that is implemented in the control system. To track downtime effectively, control system indicators of a downtime condition, as well as reason indicators, should be implemented as separate user-defined events, and be collected in a category called "Downtime". Create as many different events as should be useful. The more distinct events are logged, the better picture of downtime causes can be created.

You should also identify any conditions that may impact the machine output that are not caused by machine failure (if that is your definition of downtime) and configure user-defined events for them. Examples might be setups, changeovers, or material delays. Again, the more granular you can make the events, the better.

User-defined events can also be configured as Faults, for the purposes of calculating Mean Time Between Failure (MTBF) and other metrics. Considering only the Fault events as downtime is another option for downtime reporting.

Reports of user-defined events can be created using the **PlantMetrics Event History** report data source, with specific filters applied so that only the data associated with the desired events or event categories is displayed.

For more information, see [Report data sources on page 110](#).

The disadvantage of this method of downtime tracking is the possibility that at any point in time an activity area may not be experiencing any user-defined event, or may be experiencing more than one user-defined event. For example, a downtime event often causes other events to occur, resulting in multiple events being active at one time. This makes it difficult to account for all the time accurately without implementing the non-overlapping event logic in the control system.

Machine state

Using machine states to track downtime allows you to configure a state model for each activity area so that the whole time will be attributed to a defined machine state. This will ensure that all the time is accounted for in defined machine states, and no time is double counted. The Machine State capability allows you to prioritize the states in such a way that if there is more than one state that theoretically could occur at the same time, then the state with the highest priority becomes active. This helps prevent the problems associated with a downtime event causing other events to occur.

To use machine states to track downtime:

1. Configure the machine states relevant to your activity areas.
For more information, see [Configure machine states on page 74](#).
2. Configure a performance parameter event for each activity area for which you want to collect downtime data.
For more information, see [Configure user-defined events on page 51](#).
3. Define how the event affects machine states.
For more information, see [Configure the machine state on page 67](#).

Review the status of events

To view the status information about the events associated with the activity area:

1. Open the **Configure Performance Parameters** dialog box for the selected activity area.
2. Under **Performance Parameter Status**, click one of the following buttons:
 - **Configuration Status**

This section contains the following information:

Performance Parameters Event Status	Configuration Status	FTTM Transaction Status	Data
Event Name	Event Category	Event Type	Enabled
Schedule Exception Unavailable	Available	System Generated	Yes
Overall Available	Available	System Generated	Yes
Activity Area Exception Unavail...	Available	System Generated	Yes
Activity Area Total Part Count	Part Count	System Generated	Yes
Activity Area Scrap Part Count	Part Count	System Generated	Yes
Activity Area Good Part Count - ...	Part Count	System Generated	Yes
Activity Area Cycle Time - Point	Summarization Criteria	System Generated	Yes
Breakdown	Custom Monitored ...	User Defined	No

- **FTTM Transaction Status**

This section contains the following information:

Performance Parameters Event Status	Configuration Status	FTTM Transaction Status		
Event Name	Created	Valid	Up To Date	
Schedule Exception Unavailable	Not Applicable			
Overall Available	Not Applicable			
Activity Area Exception Unavailable	Not Applicable			
Breakdown	Not Applicable			
Activity Area Total Part Count	Not Applicable			
Activity Area Scrap Part Count	Not Applicable			
Activity Area Good Part Count - Manual	Yes	No	Yes	
Activity Area Cycle Time	Not Applicable			

Review the following for additional information.

This column:	Indicates whether or not:
Created	The transaction was created when you enabled data collection for the activity area. The Not Applicable value means that the event does not require input from the control system, therefore, the transaction has not been created.

This column:	Indicates whether or not:
	Manual events whose trigger type is Manual active/inactive event or Manual monitored continuous event have the Not Applicable value.
Valid	The transaction is valid in FactoryTalk Transaction Manager.
Up To Date	The transaction bindings are up to date and match the configured event. If the transaction is invalid and/or the bindings are not up to date, you may want to regenerate the transactions.

◦ **Data Collection Status**

This section contains the following information:

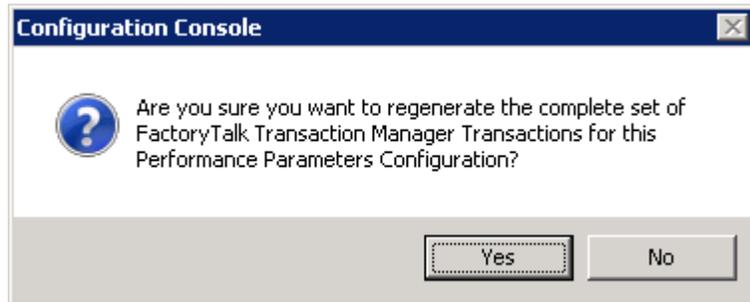
Event Name	Collection Initialized	Last Data Received	Collection Status
Schedule Available	Yes	NA	No data collection for this event
Schedule Exception Unavailable	Yes	NA	No data collection for this event
Overall Available	Yes	NA	No data collection for this event
Activity Area Exception Unavailable	Yes	NA	No data collection for this event
Activity Area Shift Id - Point	Yes	4/29/2014 09:16:32	Data Current
Activity Area Available - Point	Yes	4/29/2014 09:16:32	Data Current
Activity Area Good Part Count - Point	Yes	4/29/2014 09:17:02	Data Current

The information is displayed after the FactoryTalk Transaction Manager configuration has been started and the system is collecting data for the activity area.

3. You may want to do either of the following:

- To regenerate the transactions, under **Data Collection**, click **Generate Transactions**.

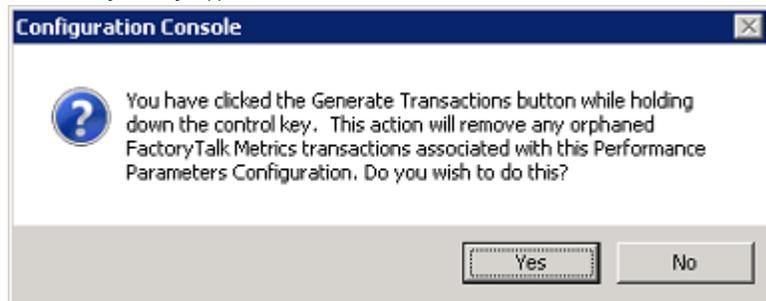
The following message appears:



Click **Yes**.

- To remove transactions that are no longer bound to a specific data point or event, press and hold down the **Ctrl** key and click **Generate Transactions**.

The following message appears:



Click **Yes**.

Start data collection

After you have finished configuring the performance parameters, and enabled data collection for the activity areas that use a particular FactoryTalk Transaction Manager configuration, you must start the FactoryTalk Transaction Manager configuration to begin the data collection.

To start the data collection:

1. On the **Tools** menu, click **FactoryTalk Transaction Manager > Manage FactoryTalk Transaction Manager Configurations**.

The **FactoryTalk Transaction Manager Configurations** dialog box appears.

It lists the FactoryTalk Transaction Manager configurations that have been imported, and the applications to which they apply. In the dialog box, you can evaluate the running status of FactoryTalk Transaction Manager configurations that are collecting data from the control system, as well as start, stop, or restart the configurations.

2. Select a FactoryTalk Transaction Manager configuration, and then click **Start**.

The configuration is started. The green traffic light icon () indicates that the configuration is running and collecting data from the control system.

Stop data collection

To stop the data collection:

1. In the **FactoryTalk Transaction Manager Configurations** dialog box, select a FactoryTalk Transaction Manager configuration, and then click **Stop**.

The red traffic light icon () indicates that the configuration is not running.

Manual data collection

FactoryTalk Metrics allows you to manually enter information that cannot be collected from the control system in real time. With the manual data collection, you can perform the following tasks:

- Add reason codes and comments to user-defined events.
- Adjust total, good, and scrap part counts.
- Add reason codes and comments to scrap events.
- Change the amount of available time.

This functionality along with other functions is also available in Report Expert. For a complete list of the functions related to the manual data collection, refer to the Report Expert Users Guide.

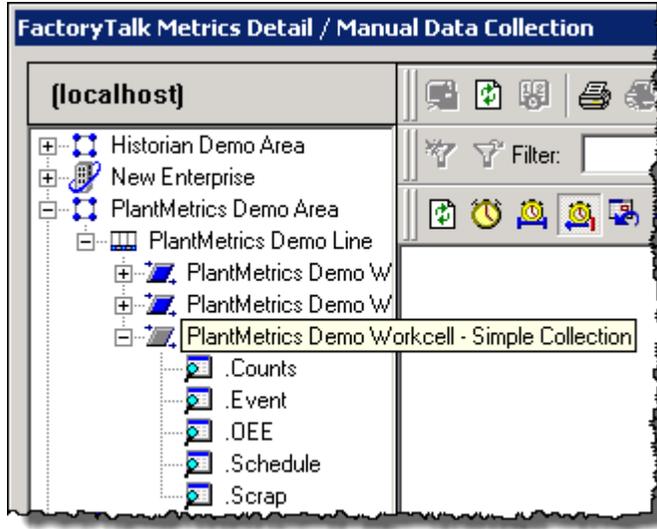
NOTE: To perform the manual data collection, you must be granted the Manage FactoryTalk Metrics Manual Data Collection privilege by your RSBizWare administrator.

To edit the collected data manually:

1. On the **Tools** menu, click **FactoryTalk Metrics > Manual Data Collection**.
The **FactoryTalk Metrics Detail / Manual Data Collection** dialog box appears.

- Expand the tree items under **PlantMetrics Demo Area**, until you get to **PlantMetrics Demo Workcell - Simple Collection**:

Simple Collection:



Tip: If you do not see the **PlantMetrics Demo Area** items, you probably have not loaded the FactoryTalk Metrics sample data to your RSBizWare database. See [Load sample activity areas on page 13](#) for details.

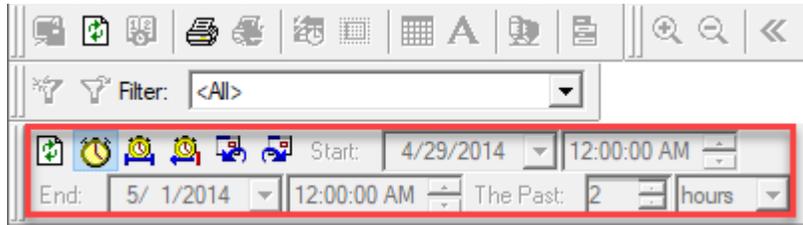
When you click each item under the selected activity area, a set of values is displayed in the right pane of the dialog box:

When you click:	These values are displayed:
Counts	The count values that were collected during the specified period for the selected activity area. In this table, you can modify the good parts, scrap parts, and total part values for the activity area.
Event	The user-defined events that occurred during the specified period for the selected activity area. In this table, you can type reason codes and comments for each user-defined event.
OEE	The OEE and other performance values calculated from the values collected during a specified period for the selected activity area. In this table, you cannot edit any records.
Schedule	The shift-related time values that were collected during the specified period for the selected activity area. In this table, you can modify the scheduled available and actual available values for the activity area.
Scrap	The scrap events that occurred during the specified period for the selected activity area.

When you click:	These values are displayed:
	In this table, you can type comments for the scrap event. If the scrap event has a lookup list associated with it, you may also type a reason code for the scrap event.

3. Click **Schedule**.

In the right pane of the dialog box, a set of toolbars and a table appear.



The time selection toolbar (marked with the red frame) controls the time period for which the data will be displayed in the table. By default, the past two hours are displayed. If you want to modify a record that was collected more than two hours ago, use the tools on the toolbar to change the time period:

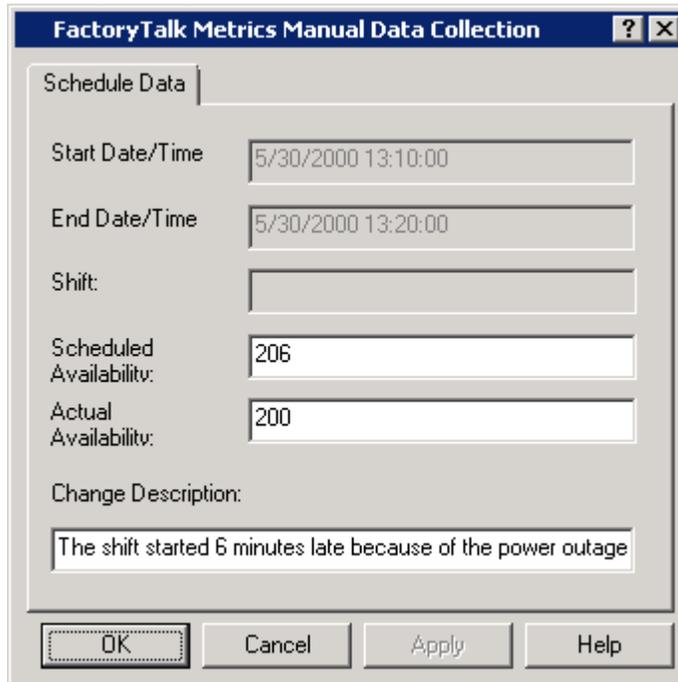
Click:	To:
	Update the table with the data range that you have chosen.
	Show data without any time filters applied.
	Show data between a start and end date. For example: Start: 4/30/2014 12:00:00 AM End: 5/1/2014 12:00:00 AM
	Show data for the past X time units. For example: The Past: 2 hours
	Show data for the past X time units before the end date that you have specified. For example: End: 5/1/2014 12:00:00 AM The Past: 2 hours
	Show data for the next X time units after the start date that you have specified. For example: Start: 4/30/2014 12:00:00 AM The Next: 2 hours

Click and then , if the data is not loaded automatically.

The table is populated with all the data that has been collected for this activity area.

Start Shift	Start Time	End Time
(all)	(all)	(all)
2000-05-30 00:00:00.000	2000-05-30 13:08:25.000	2000-05-30 13:10:00.000
2000-05-30 00:00:00.000	2000-05-30 13:10:00.000	2000-05-30 13:20:00.000
2000-05-30 00:00:00.000	2000-05-30 13:20:00.000	2000-05-30 13:30:00.000
2000-05-30 00:00:00.000	2000-05-30 13:30:00.000	2000-05-30 13:40:00.000
2000-05-30 00:00:00.000	2000-05-30 13:40:00.000	2000-05-30 13:50:00.000

4. Right-click a record that you want to edit, and then click **Manual Data Collection Properties**.
 The **FactoryTalk Metrics Manual Data Collection** dialog box appears.
 The content of the dialog box differs depending on what record type (Count, Event, Schedule, OEE, Schedule, or Scrap) you want to change.
5. Edit the values that you want to change.
 In the example presented in the figure below, we subtracted 6 minutes from the **Actual Availability** value, due to the power outage.



6. Click **OK**.

Automated configuration

FactoryTalk Metrics contains additional software and content that is designed to reduce the time it takes to implement a FactoryTalk Metrics system. This content automates the configuration of FactoryTalk Metrics, if you have Rockwell Automation® ControlLogix® controllers that can use a user-defined type (UDT).

The additional content provided with FactoryTalk Metrics includes:

- [FactoryTalk Metrics UDT on page 85.](#)
- [FactoryTalk Metrics Configuration Tool on page 97.](#)

FactoryTalk Metrics UDT

If you collect data with a ControlLogix controller and you wish to incorporate them in the FactoryTalk Metrics data collection, use the user-defined data type (UDT) named FTM_Workcell. It is a workcell template that contains a comprehensive set of tags that are typically used with FactoryTalk Metrics.

The FTM_ UDT is used by the FactoryTalk Metrics Configuration Tool to automatically configure the performance parameters of selected FactoryTalk Metrics workcells. Each tag from the FTM_Workcell UDT is used for a particular performance parameter. Each workcell in the plant model uses a different instance of the UDT in the control system, while all of the workcells are identically configured.

Once the UDT tags are imported to FactoryTalk Metrics, you can modify the performance parameters manually in the Configuration Console.

UDT tags and performance parameters

The following table lists the UDT tags from a ControlLogix controller and their corresponding performance parameters in FactoryTalk Metrics. You may need to modify the UDT tags in the controller to ensure that they contain valid data for FactoryTalk Metrics to collect.

All the items listed in the table are unscheduled, unless otherwise stated.

These items of the UDT workcell template:		Are mapped to these performance parameters in FactoryTalk Metrics:	
Item	Data type	Item	Description
PartId	STRING	Part Id	Identifies the product being produced at the workcell. Its value changes when the workcell produces a different part. You must coordinate this value with the part count values by associating the part counts with the correct Part Id.
IdealCT	REAL	Ideal Cycle Time	The time required for one part to pass through the workcell under ideal conditions. It is

These items of the UDT workcell template:		Are mapped to these performance parameters in FactoryTalk Metrics:	
Item	Data type	Item	Description
			a real value, represented in seconds. Usually, the Ideal Cycle Time value changes only if the Part Id changes.
GoodParts	INT	Good Part Count	The number of the first quality parts produced by the workcell. It acts like an accumulator and increases in value. The value never decreases unless it is reset.
ScrapParts	INT	Scrap Part Count	The number of parts produced by a workcell that cannot be categorized as Good Parts. From the machine-efficiency perspective, the parts have no value, and the cycle time taken to produce them at the current workcell has been wasted. It acts like an accumulator and increases in value. The value never decreases unless it is reset.
TotalParts	INT	Total Part Count	The value is not taken from the controller, but calculated by FactoryTalk Metrics as: $\text{Good Parts} + \text{Scrap Parts} = \text{Total Parts}$ If you need the Total Parts value to be collected from the controller, you must configure it manually in the Configuration Console after you run the FactoryTalk Metrics Configuration Tool.
Shift	INT	Scheduled Availability - Shift	By default, the FactoryTalk Metrics Configuration Tool configures Scheduled Availability to be collected from the controller. The

These items of the UDT workcell template:		Are mapped to these performance parameters in FactoryTalk Metrics:	
Item	Data type	Item	Description
			<p>UDT Shift tag is expected to contain a number that corresponds to the workcell's current shift number. If the Shift value is greater than zero, the workcell is assumed to be on shift and available to run.</p> <p>Tip: You can create a list to convert numeric values returned by this tag into string values. See Configure scheduled availability on page 37 for details.</p>
Running	BOOL	Running State	<p>Determines whether or not a workcell is running. It is an important component of several KPI calculations.</p> <p>If the Running tag value is <code>true</code> (or <code>high</code>), the workcell is considered to be running.</p>
Monitored_Availability	BOOL	Monitored Availability	<p>A real-time override of Scheduled Availability. It is commonly used to help prevent Available Time from accumulating, if the workcell is scheduled to be available but cannot produce anything due to some factor that is beyond its control.</p>
Monitored_Value	INT	Custom Events, monitored value type	<p>Contains a machine state code.</p> <p>Tip: You can create a list to convert numeric values returned by this tag into string values. See Configure scheduled availability on page 37 for details.</p>
Events_Digital	BOOL[32]	Custom Events (with no event values)	<p>An array of Boolean values interpreted by FactoryTalk</p>

These items of the UDT workcell template:		Are mapped to these performance parameters in FactoryTalk Metrics:	
Item	Data type	Item	Description
			<p>Metrics as triggers for 10 user-defined digital events. Each of the values in the array should represent a single important event that FactoryTalk Metrics will capture (such as downtime, light curtain break, and product changeover). The start of an event is indicated by a change in the trigger value from 0 to 1 (or low to high). The end of an event is indicated by a change in the trigger value from 1 to 0 (or high to low).</p> <p>Once the events are imported to FactoryTalk Metrics, edit the performance parameters and give the events meaningful names for reporting purposes. See Modify performance parameters on page 105 for details.</p>
Events_Analog	FTM_AnalogEvent[5]	Custom Events (with event values)	An array of 5 occurrences of the FTM_AnalogEvent UDT.
Trigger	BOOL	Event Trigger	<p>The FTM_AnalogEvent UDT is an array of one Boolean value and one integer value. The Boolean values represent triggers. The 5 triggers are interpreted by FactoryTalk Metrics as triggers for 5 analog events. The 5 integer values are interpreted as event values, usually reason codes for events. The event values are scheduled. Each of the trigger/value pairs is independent, and indicates that an important workcell event occurs.</p>
Value	INT	Event Value	

These items of the UDT workcell template:		Are mapped to these performance parameters in FactoryTalk Metrics:	
Item	Data type	Item	Description
			<p>The trigger value changes from 0 to 1 (or low to high) when the event to track occurs, and changes back to 0 (or low) when the event ends. The controller copies the event value to the Value tag before the event ends and the trigger returns to low. Each trigger/value pair indicates only one distinct event that may have multiple causes (for example, downtime, operator stop, and so on).</p> <p>Once the events are imported to FactoryTalk Metrics, edit the performance parameters and give the events meaningful names for reporting purposes. Assign also lookup lists to translate the integer values returned in the Value tag to string values. See Modify performance parameters on page 105 for details.</p>
Flex_Integer	INT[5]	Flex Fields (Integer type)	<p>An array of 5 integer flex fields. This type of flex fields is not used by the FactoryTalk Metrics Configuration Tool. If you want to use it, you must configure the performance parameters manually, and change the flex field tag from Flex_String to Flex_Integer.</p>
Flex_Bool	BOOL[32]	Flex Fields (Boolean type)	<p>An array of 32 boolean flex fields. This type of flex fields is not used by the FactoryTalk Metrics Configuration Tool. If you want to use it, you must configure the performance parameters manually, and</p>

These items of the UDT workcell template:		Are mapped to these performance parameters in FactoryTalk Metrics:	
Item	Data type	Item	Description
			change the flex field tag from Flex_String to Flex_Integer .
Flex_String	STRING[5]	Flex Fields (String type)	An array of 5 string flex fields. A FactoryTalk Metrics application can have 5 flex fields, or user-defined summarization criteria. The fields can be an integer, boolean, or string. Flex fields are defined system-wide for all workcells. They usually contain values necessary for providing context for performance reporting. The FactoryTalk Metrics Configuration Tool chooses the string tag for each flex field.

Set up communication

In the following steps, you will learn how to set up communication between a ControlLogix controller and FactoryTalk Metrics in your RSBizWare environment.

We assume that you have already performed the following actions:

- Configured your RSBizWare environment, including:
 - The configuration of user-define summarization fields (flex-fields) with string value data types.
- Created a plant model for your facility.

You should create entries in the plant model for at least the site, area, line, and workcell levels shown, because this is the plant model structure that is used in the Report Expert report templates. Typically, machines that are to be monitored by FactoryTalk Metrics are defined at the workcell level. The FactoryTalk Metrics Configuration Tool only configures plant model entries at the workcell level.

If you want to create the RSBizWare environment from scratch, refer to the following documents:

- *FactoryTalk Metrics Administration Guide*, section Performing a clean installation of RSBizWare. You will find here information on installing and configuring your RSBizWare environment.
- This document, section [The plant model on page 11](#). You will find here information on creating a plant model.

Once you configured your RSBizWare environment, follow these steps to configure the communication between your ControlLogix controller and FactoryTalk Metrics:

1. [Configure FactoryTalk Linx on page 91](#).
2. [Import the FactoryTalk Metrics UDT to the ControlLogix controller on page 93](#).

3. [Create tags based on the FactoryTalk Metrics UDT on page 94.](#)
4. [Create FactoryTalk Transaction Manager and FactoryTalk Metrics configurations on page 97.](#)

Configure FactoryTalk Linx

Perform the following steps on the computer on which you have installed FactoryTalk Linx.

Configure FactoryTalk Linx as an OPC server so that you can use the FactoryTalk Metrics UDT in ControlLogix controllers to establish communication with FactoryTalk Metrics. Other OPC servers may also be required if you use controllers other than ControlLogix as sources for FactoryTalk Metrics data.

To configure FactoryTalk Linx:

1. Open the FactoryTalk® Administration Console.
2. In the **Explorer** pane, right-click **Network**, and then click **New Application**.

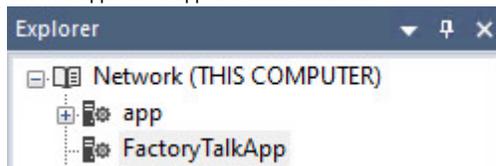


Tip: All the OPC servers and controllers that are used by FactoryTalk Metrics should be contained within a single application in the FactoryTalk® Directory.

The **New Application** dialog box appears.

3. In the **Name** box, type a name for the application, for example `FactoryTalkApp`.
4. Click **OK**.

The new application appears under **Network**.



5. Right-click the new application, and then click **Add New Server > Rockwell Automation Device Server (FactoryTalk Linx)**.

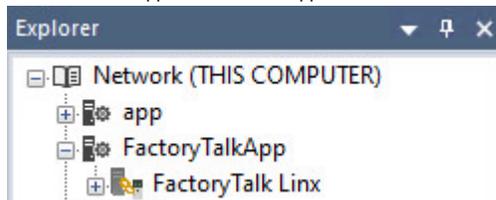
The **FactoryTalk Linx Server Properties** dialog box appears.

6. Under **Computer hosting the FactoryTalk Linx server**, check if the computer that hosts the server is selected correctly. If not, point to the correct computer.

NOTE: To learn about other configuration options, refer to the FactoryTalk Linx user documentation.

7. Click **OK**.

The new server appears under the application.



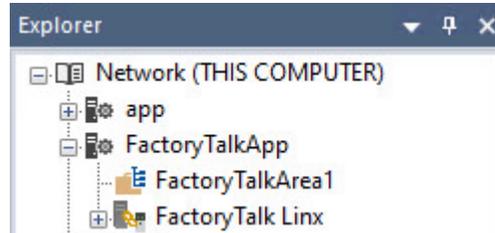
8. (Optional) Add an area:



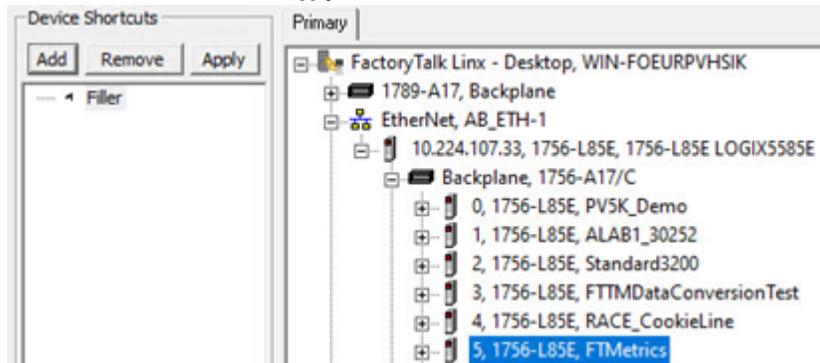
Tip: Areas organize and subdivide a distributed network application into logical or physical divisions. For example, separate areas may correspond to separate manufacturing lines in a facility, separate plants in different geographical locations, or different manufacturing processes.

- a. Right-click the new application, and then click **New Area**.
The **New Area** dialog box appears.
- b. In the **Name** box, type a name for the new area, for example `FactoryTalkArea1`.
- c. Click **OK**.

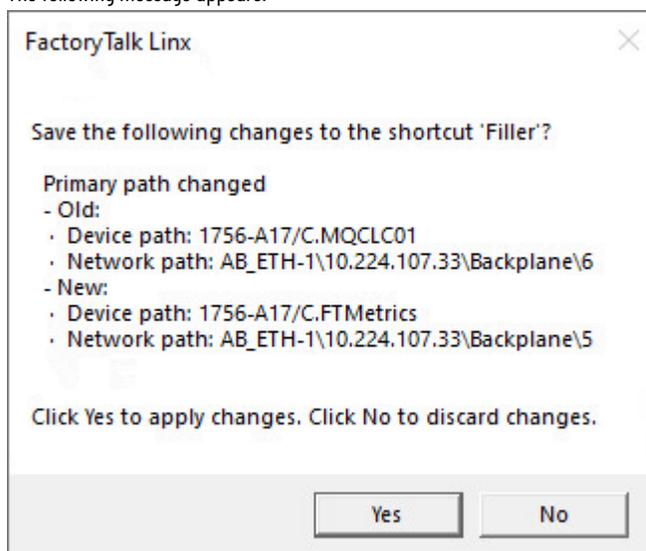
The new area appears under the application.



9. Expand the **FactoryTalk Linx** server item, and then double-click **Communication Setup**.
10. In the right pane of the window, under **Device Shortcuts**, click **Add**.
A new shortcut appears with the default name, available for editing.
11. Type a name for the shortcut, for example `Filler`, and then press **Enter**.
The shortcut will reference all data tags within a given ControlLogix device. If the device contains data tags from only one workcell, it is recommended that you give the same name to both the workcell that you created for the FactoryTalk Metrics UDT in your plant model and the shortcut. If the device contains data tags from more than one workcell, use some other meaningful name for the shortcut. Create a shortcut for each ControlLogix device.
12. On the **Primary** tab, navigate to the controller to which you are creating the shortcut.
13. Click the controller, and then click **Apply**.

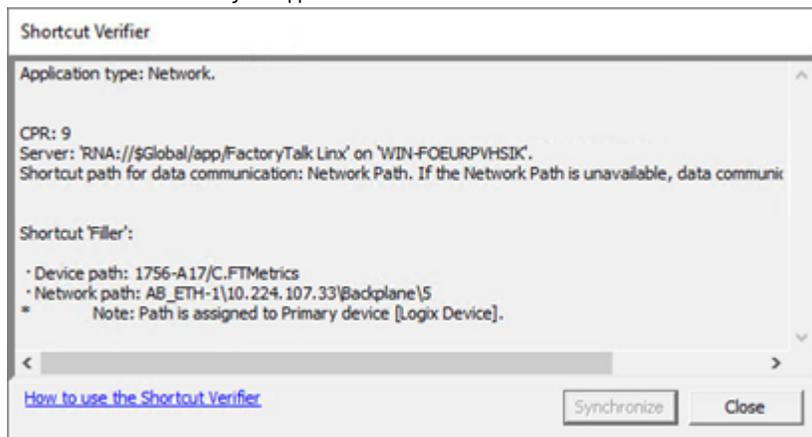


The following message appears:



14. Click **Yes**.
15. At the bottom of the window, click **Verify**.

The **Shortcut Verifier** dialog box appears.



The dialog box displays the shortcut verification status.

For details on messages that may appear in the dialog box, click **How to use the Shortcut Verifier**.

16. Click **Close**.
17. At the bottom of the window, click **OK**.

Import the UDT

In this step, you will import the FactoryTalk Metrics UDT to your ControlLogix program so that the FactoryTalk Metrics Configuration Tool can use in FactoryTalk Metrics the data tags that are defined in the UDT.

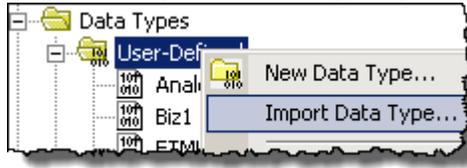
To import the UDT to the controller project:

1. Go to **Start > All Programs > Rockwell Software > Studio 5000**.
The **Rockwell Software Studio 5000** window appears.
2. Under **Open**, click **Existing Project**.
The **Open Project** dialog box appears.
3. Navigate to and select the project file (.acd) of the controller that you want to synchronize with FactoryTalk Metrics.

4. Click **Open**.

The project is loaded to the **Logix Designer** window.

In the Controller Organizer, under **Data Types**, right-click **User-Defined**, and then **Import Data Type**.



The **Import Data Type** dialog box appears.

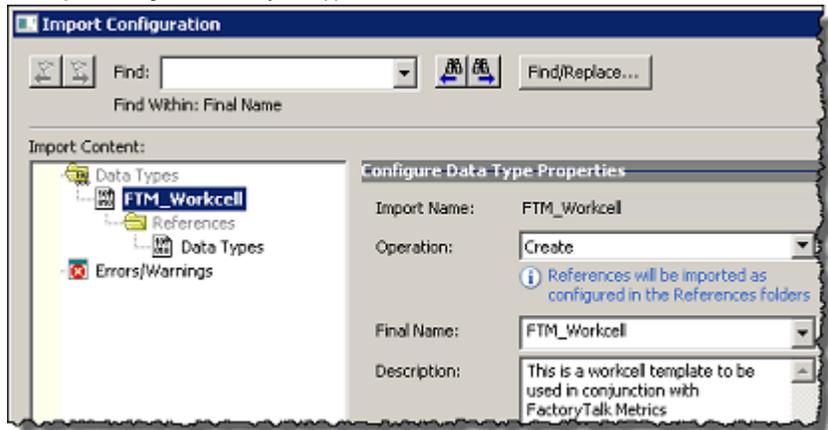
5. Navigate to **<Program Files>\Rockwell Software\RSBizWare**, and then select the **FTM_Workcell.L5X** file.



Tip: **<Program Files>** represents the path to the **Program Files** folder in which you installed the RSBizWare suite.

6. Click **Import**.

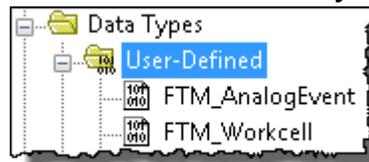
The **Import Configuration** dialog box appears.



7. Click **OK**.

The following user-defined data types appear under the **User-Defined** folder:

- **FTM_AnalogEvent**
This UDT collects information for custom events. It is referenced by the **FTM_Workcell** UDT.
- **FTM_Workcell**
This UDT defines the structure used to collect the information for a standard FactoryTalk Metrics workcell and references the **FTM_AnalogEvent** UDT.



You will use these data types to create an array of tags designed to store FactoryTalk Metrics data.

Create tags based on the UDT

In this step, you will create an instance of the FactoryTalk Metrics UDT for the workcell that you want to be included in FactoryTalk Metrics.

It is recommended that you create one instance of the FactoryTalk Metrics UDT in the control system for each workcell defined in the plant model.

All data points in the UDT, with the exception of Good Parts, are optional. Therefore, you do not have to use all the data points contained in the UDT. The FactoryTalk Metrics Configuration Tool maps the data points to the appropriate FactoryTalk Metrics performance parameters, and you need to manually remove the data points that you do not use from the FactoryTalk Metrics performance parameters. See [Modify performance parameters on page 105](#).

If your controller contains data tags for more than one workcell that will be configured in FactoryTalk Metrics, you may create an array of UDTs rather than several instances of the UDT with different names. The dimension of the array should be the same as the number of workcells that are included in the controller.

To create an array of the FactoryTalk Metrics UDT instances:

1. In Studio 5000®, in the Controller Organizer, double-click **FTM_Workcell**.

In the right pane of the window, the tags that constitute the **FTM_Workcell** UDT are displayed.

Members:			
Name	Data Type	Description	
PartId	INT	Part Id	
IdealCT	REAL	Ideal Cycle Time	
GoodParts	INT	Good Part Count	
ScrapParts	INT	Scrap Part Count	
TotalParts	INT	Total Part Count	
Shift	INT	Shift	
Running	BOOL	Machine running status	
Monitored_Availability	BOOL	Status indication	

For details on how the tags in the UDT relate to individual performance parameters in FactoryTalk Metrics, see [UDT tags and performance parameters on page 85](#).

2. Under the **Controller** item, right-click **Controller Tags**, and then click **New Tag**.



The **New Tag** dialog box appears.

3. In the **Name** box, type a name for the array of UDTs, for example `workcell`.

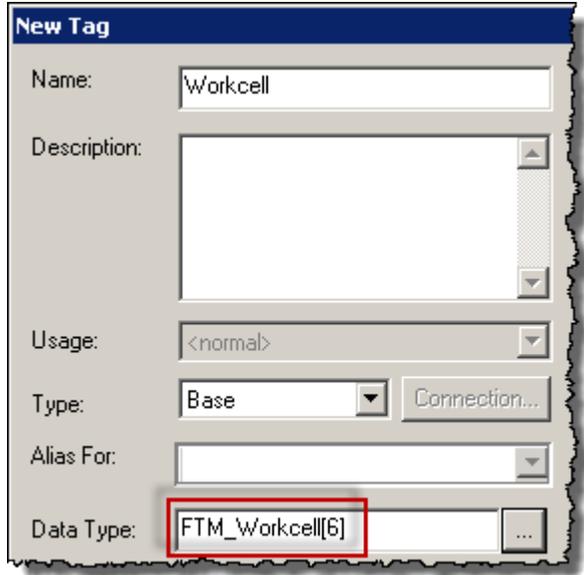


Tip: We suggest that you use "Workcell" as the name of the UDT array, because it is the default name used by the FactoryTalk Metrics Configuration Tool.

4. Next to the **Data Type** box, click **...**.
The **Select Data Type** dialog box appears.
5. Under **Data Types**, click **FTM_Workcell**.
6. In the **Dim 0** box, change the value to the number of workcells in your controller.

- Click **OK**.

In this example, we created an array of six workcells.



- Click **Create**.

The array of UDT instances appears at the bottom of the list of the controller tags. The tags are named **Workcell[0]**, **Workcell[1]**, and so on. These instances are sufficient to configure the same number of FactoryTalk Metrics workcells.

[-] Workcell	{...}	{...}	FTM_Workcell[6]
[+] Workcell[0]	{...}	{...}	FTM_Workcell
[+] Workcell[1]	{...}	{...}	FTM_Workcell
[+] Workcell[2]	{...}	{...}	FTM_Workcell
[+] Workcell[3]	{...}	{...}	FTM_Workcell
[+] Workcell[4]	{...}	{...}	FTM_Workcell
[+] Workcell[5]	{...}	{...}	FTM_Workcell

- Change the existing program file to ensure that the data points in the UDT that you want to use in the FactoryTalk Metrics application contain accurate and timely data.

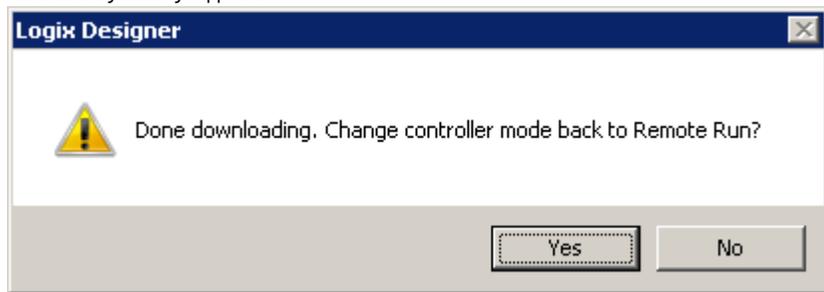
In general, the type of instruction that you will add to the program depends on the destination data type:

For this data type:	Used in the UDT by:	Use these instructions:
Integer	Part Counts	Move (MOV)
Boolean	Event Triggers	A combination of Examine If Open (XIO) and Output Energize (OTE)
String	Part ID, Flex_String	Copy File (COP) In the Length box of the COP instruction, specify the Source_Tag.LEN value.



Tip: For information about adding instructions to your program file, refer to the RSLogix™ documentation.

10. On the **Communications** menu, click **Download**.
The **Download** dialog box appears.
11. Click **Download**.
When the program is loaded to the controller, you can run the program file.
The following message appears:



12. Click **Yes**.
13. Repeat the steps for each controller program that will be used by FactoryTalk Metrics.

Create configurations

The FactoryTalk Metrics Configuration Tool lets you enhance the process of creating configurations of multiple work cells for use in FactoryTalk Transaction Manager and FactoryTalk Metrics. Depending on the configuration type selected, certain stages of the process are automated.

Configuration types

With the FactoryTalk Metrics Configuration Tool you can define the following configuration types:

- **PackML UDT configuration**
Data is loaded from the FactoryTalk Metrics SQL Server database and a controller program with a data structure specific to the PackML user-defined data type (UDT).
Use this configuration to automatically configure certain properties of workcells using data loaded from the controller program with workcell properties from the SQL Server database, and enhance them with additional data.
- **FTM UDT configuration**
Data is loaded from the FactoryTalk Metrics SQL Server database with properties specific to the FTM UDT.
Use this configuration to manually modify certain properties of the workcell data loaded from the SQL Server database that are related to a given control connector.

Configuration flow

To create a configuration, perform the following steps:

1. [Select the configuration type and load workcell data on page 98.](#)
Select the type of the configuration that you want to create, and load workcells from the FactoryTalk Metrics SQL Server database (or a controller).
2. [Define your FactoryTalk Transaction Manager configuration on page 99.](#)
Select workcells and define the configuration for them.
3. (New configurations only) [Register your FactoryTalk Transaction Manager configuration for data collection on page 102.](#)
If you created a configuration, register it in the Service Console.

4. (Optional) [Import lookup lists and machine states on page 103.](#)
Import lookup lists and machine states from CSV files to modify the workcells.
5. [Define your FactoryTalk Metrics configuration on page 104.](#)
Define the configuration for the selected workcells.

Select a configuration and data

To select the configuration type and load workcell data from the FactoryTalk Metrics SQL Server database or a controller:

1. Go to **Start > All Programs > Rockwell Software > RSBizWare > FactoryTalk Metrics Configuration Tool.**
The **FactoryTalk Metrics configuration tool** window appears.
2. Under **configuration type**, choose either of the configuration types:
 - **PackML UDT**
For this configuration, data is loaded from the FactoryTalk Metrics SQL Server database and a controller program with a data structure specific to the PackML user-defined data type (UDT).
Use this configuration to automatically configure certain properties of workcells using data loaded from the controller program with workcell properties from the SQL Server database, and enhance them with additional data.
 - **FTM UDT**
For this configuration, data is loaded from the FactoryTalk Metrics SQL Server database with properties specific to the FTM UDT.
Use this configuration to manually modify certain properties of the workcell data loaded from the SQL Server database that are related to a given control connector.
3. In the **Data Source Name** list, select the name of the ODBC data source configured for your RSBizWare SQL Server database.
4. In the **DB user name** box, type the name of your RSBizWare SQL Server database user.
5. In the **DB user password** box, type the password of your RSBizWare SQL Server database user.
6. In the **Application name** list, select the name of the application that you defined in the FactoryTalk Administration Console for your OPC server (FactoryTalk Linx).
7. Do either of the following:
 - If you have selected the **PackML UDT** configuration, click **Load from Controller.**

IMPORTANT: For the PackML UDT configuration, this step is **irreversible.**

You will not be able to change the configuration type after the data has been loaded. To start another configuration, close and then open the configuration tool again.

- If you have selected the **FTM UDT** configuration, click **Load from Database.**
The data is loaded and displayed in a list. You will use the data to create configuration files for FactoryTalk Transaction Manager and/or FactoryTalk Metrics.

8. Do any of the following:
 - If you are creating a FactoryTalk Transaction Manager configuration, go to [Define an FTTM configuration on page 99](#).
 - If you are creating or updating a FactoryTalk Metrics configuration, go to [Define an FTMx configuration on page 104](#).
 - If you want to load additional machine states or lookup lists for your FactoryTalk Metrics configuration, go to [Import CSV files on page 103](#).

Define an FTTM configuration

In this step you will define a FactoryTalk Transaction Manager configuration for the workcells that you will select, update the selected workcells, if needed, and import the configuration to FactoryTalk Transaction Manager.

To select workcells and define the FactoryTalk Transaction Manager configuration for them:

1. Click the **FT Transaction Manager** tab.
2. Select the workcells for which you want to create the configuration.

By default, all the workcells are selected.

 - To select the workcells individually, click **Deselect all**, and then select the **Generate** checkbox next to the workcell of your choice.
 - To select all workcells, click **Select all**.
3. Modify the selected workcells as needed.
 - For details on the PackML UDT configuration items, see [PackML UDT configuration items on page 101](#).
 - For details on the FTM UDT configuration items, see [FTM UDT configuration items on page 101](#).

NOTE: If you create a configuration for the workcells that have already been configured, the existing workcell information will be overwritten in the database when the configuration is imported and registered.

4. Next to the **FTTM XML out file** box, click .

The **Open** dialog box appears.
5. Navigate to the location in which you want to store the FactoryTalk Transaction Manager XML configuration file.

This is a file with the configuration data that you will import to FactoryTalk Transaction Manager.
6. In the **File name** box, type a name for the file, and then click **Open**.

The file appears in the **FTTM XML out file** box.
7. In the **FTTM config name** box, type the name for the FactoryTalk Transaction Manager configuration you are creating or the name of an existing configuration that you want to update.

In this example, the configuration is named `FTTMconfiguration`.
8. In the **FTTM config path** box, type the location of or click  to navigate to the location of the FactoryTalk Transaction Manager configuration files.

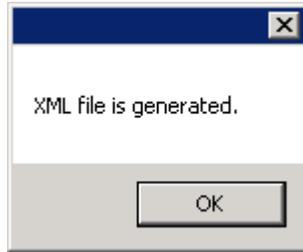
In this location, all files related to your FactoryTalk Transaction Manager and FactoryTalk Metrics configuration are stored, such as the configuration and log files.

 - If you modify an existing configuration, point to its location path.
 - If you create a configuration, the path you provide will be used as the location of the configuration file.

9. In the **Connector user name** box, type the username for the FactoryTalk directory as defined in the FactoryTalk Administration Console. Follow this structure: `ComputerName\UserName` or `DomainName\UserName`.
10. In the **Connector password** box, type the user password for the connector.
If you do not enter a password and there is already an existing password assigned to the particular user, the password remains unchanged.
11. (Optional) Select the **DataPoints only** option, if you want to have only data points (data tags) generated for the modified workcells.
Use this option if you want to update an existing configuration with new data rather than overwrite it entirely.

12. Click **Generate FTTM XML**.

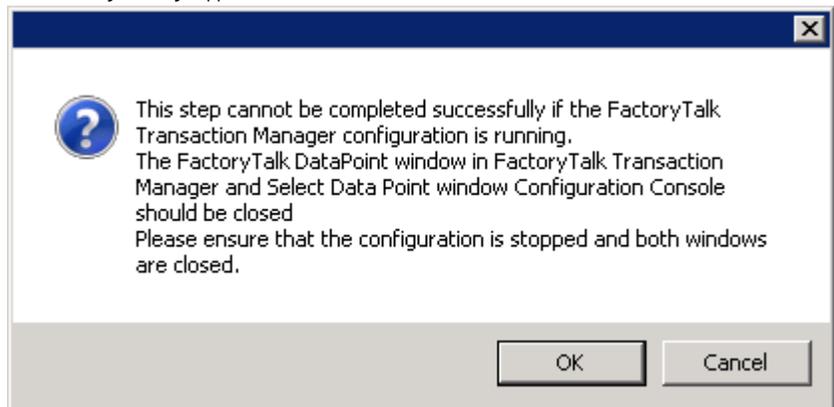
The following message appears:



13. Click **OK**.

14. Click **Import to FTTM**.

The following message appears:



15. Click **OK**.

The configuration is imported to FactoryTalk Transaction Manager.

If the configuration was imported with errors, a message listing the number and code of the errors appears.

Check the error log file for details, correct the configuration, and then try again.

The error log file is stored in the FTTM configuration path that you selected in step 8.

The name of the file is structured in the following way: **<ConfigurationName>_XML.log**.

16. Do any of the following:
 - If you created a configuration, go to [Register the configuration on page 102](#).
 - If you want to load machine states and/or lookup lists to your configuration, go to [Import CSV files on page 103](#).
 - If you want to define a FactoryTalk Metrics configuration, go to [Define an FTMx configuration on page 104](#).

PackML UDT configuration items

The following workcell properties are displayed for the PackML UDT configuration after you click **Load from Controller** on the **Start** tab:

Item	Description
Path	The path to the workcell in the PackML data structure. This box is read-only.
Work Cell Name	The name of the workcell in the PackML data structure. This box is read-only.
Work Cell Name from DB	The name of the workcell in the FactoryTalk Metrics database. When a row is selected, the box is automatically filled with the first name from the list. You can assign a different name to it, as needed, in Define an FTMx configuration on page 104 .
Shift Lookup List	The shift lookup list for a workcell that you import in Import CSV files on page 103 .
Event Lookup List	The state event lookup list for a workcell that you import in Import CSV files on page 103 .

FTM UDT configuration items

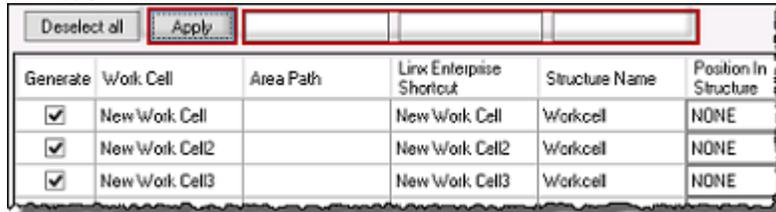
The following workcell properties are displayed for the FTM UDT configuration.

Modify the editable boxes in [Define an FTMM configuration on page 99](#) to match your configuration:

Item	Description
Work Cell	The name of the workcell in the database. This box is read-only.
Area Path	Type the area path to the workcell, as it appears in the FactoryTalk Administration Console. If the workcell is placed in an area within an area, type a slash between the area names (for example, Area1/Area2). If you have not created an area path in the application (for example, if the OPC Server is located directly in the application root folder), leave the box blank.
Linx Enterprise Shortcut	Type the name of the shortcut created for the workcell in FactoryTalk Linx or RSLinx Classic. By default, this name is the same as the workcell name. If the name of the shortcut in RSLinx is different, type the correct shortcut name.
Structure Name	Type the name of the FactoryTalk Metrics UDT workcell.
Position In Structure	Select the position of the workcell in the array.

To set values for multiple workcells in the list:

1. Select the **Generate** checkbox next to the workcells that you want to modify.
2. Type the values in the respective boxes.
Each box applies to the column right below it.
3. Click **Apply**.



Register the configuration

If you have updated an existing FactoryTalk Transaction Manager configuration that is already registered in the Service Console, go to [Import CSV files on page 103](#) or [Define an FTMx configuration on page 104](#).

To register the FactoryTalk Transaction Manager configuration for data collection:

1. Open the Service Console.
2. Expand **Security Services Manager > Servers > Information Services Manager**.
3. Right-click **Data Collection**, and then click **Register FactoryTalk Transaction Manager Configuration**.
The **FactoryTalk Transaction Manager to RSBizWare Registration Wizard** appears.
4. Click **Next**.
5. On the **Local or Remote** page, click:



6. Click **Next**.
7. On the **Select FactoryTalk Transaction Manager Configuration** page, select the configuration that you imported to FactoryTalk Transaction Manager.
8. Under **Choose which...** select **FT Metrics**.
9. Click **Next**, and then click **Finish**.

The registered configuration appears under **Data Collection**.

It is named with the name that you provided in the FTTM configuration name in [Define an FTTM configuration on page 99](#).



10. Do either of the following:
 - If you want to load machine states and/or lookup lists to your configuration, go to [Import CSV files on page 103](#).
 - If you want to define a FactoryTalk Metrics configuration, go to [Define an FTMx configuration on page 104](#).

Import CSV files

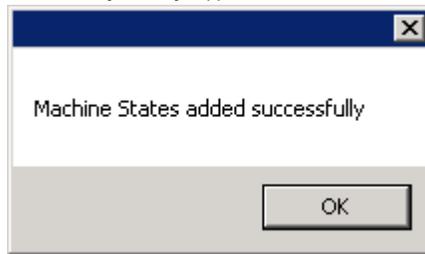
In this step you can import to your configuration machine states, shift and event lookup lists from CSV files.

NOTE: This step is optional.

To load the machine states:

1. On the **FT Metrics Lists** tab, in the **Machine State list** box, type the location of or click  to navigate to the CSV file that contains machine states.
2. Click **Create**.

The following message appears:

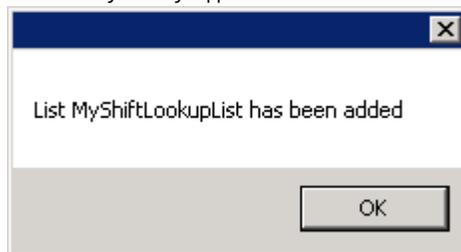


The machine state list is added to your configuration.

To create a shift lookup list:

1. Click **Shift Lookup List**.
2. In the **List Name** box, type a name for the list.
3. In the **Dictionary list** box, type the location of or click  to navigate to the CSV file that contains the lookup code values.
4. Click **Create**.

The following message appears:

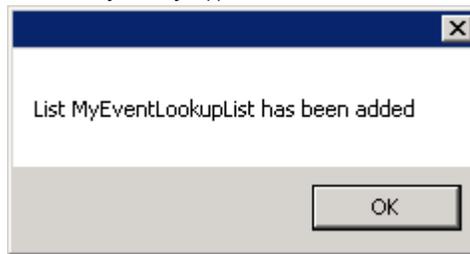


The shift lookup list is added to your configuration.

To create a state event lookup list:

1. Click **State Event Lookup List**.
2. In the **List Name** box, type a name for the list.
3. In the **Dictionary list** box, type the location of or click  to navigate to the CSV file that contains the lookup code values.
4. (Optional) Select the **Bind event list with states** checkbox, if you want to have each state event automatically associated with a machine state of the same name.
5. Click **Create**.

The following message appears:



The event lookup list is added to your configuration.

6. Go to [Define an FTMx configuration on page 104](#).

Define an FTMx configuration

To create and import the FactoryTalk Metrics configuration file:

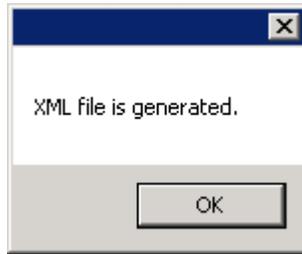
1. Click the **FT Metrics** tab.
2. (PackML UDT configuration only) Assign shift and state event lookup lists to the selected workcells, if needed. For details, see [PackML UDT configuration items on page 101](#).

NOTE: In this step, you can exclude from the configuration some workcells that you selected in [Define an FTTM configuration on page 99](#).

However, you cannot select additional workcells. This would cause inconsistencies between configurations for FactoryTalk Transaction Manager and FactoryTalk Metrics, as well as errors when importing the configurations to the database.

3. Next to the **FT Metrics XML file** box, click . The **Open** dialog box appears.
4. Navigate to the location in which you want to store the FactoryTalk Transaction Manager XML configuration file. This is a file with the configuration data that you will import to FactoryTalk Transaction Manager.
5. In the **File name** box, type a name for the file, and then click **Open**. The file appears in the **FT Metrics XML file** box.
6. In the **BizWare login** box, type the sign-in name of the RSBizWare database user.
7. In the **BizWare password** box, type the password of the RSBizWare database user.
8. Click **Update lists from database**. Available FactoryTalk Transaction Manager configurations are loaded to the **FTTM configuration** list.
9. In the **FTTM configuration** list, select the name of the FactoryTalk Transaction Manager configuration that you want to use.
10. In the **Event categories** box, type the location of or click to navigate to the location of a CSV file with control connector values and event categories assigned to them, which you want to add to the configuration.
11. (FTM UDT configuration only) Select the **Disable events** checkbox, if you do not want the information on the occurrence of the events for the selected workcells to be collected in the database. By default, all events for the selected workcells are registered, and the information on their occurrence is collected in the database. If you want to enable this option again after you import the configuration to FactoryTalk Metrics, you need to do this in the Configuration Console.
12. Click **Generate FT Metrics XML**.

The following message appears:



13. Click **Import to FT Metrics**.

The configuration is imported to FactoryTalk Metrics.

If the configuration was imported with errors, a message listing the number and code of the errors appears.

Check the error log file for details, correct the configuration, and then try again.

The error log file is stored in the FTTM configuration path that you provided in [Define an FTTM configuration on page 99](#).

The name of the log file is **WorkcellDeployment.log**.

Modify performance parameters

After you imported the FactoryTalk Metrics performance parameters with FactoryTalk Metrics Configuration Tool to FactoryTalk Metrics, you can customize them in the Configuration Console. For details, see [Performance data on page 15](#).

When customizing the imported performance parameters, keep the following in mind:

- Every data point in the FactoryTalk Metrics UDT is mapped to the appropriate performance parameter for every workcell. You may not have use for all of the data points in the UDT, and you may not have programmed them to contain valid data when you added the UDT to the control program. If the control program is not populating a UDT data point with valid data, you should delete that data point from the performance parameters. If there are events, you can disable or delete unused events.
- Every workcell is configured identically. In a real application, this is rarely the case. You can customize each workcell using the Configuration Console.
- Make sure that the performance parameters are configured as expected, and are programmed in the controller (for example, all event triggers are configured for low to high transition).
- Default names are assigned to events, and events are grouped into categories by event type. You may change the way the events are grouped, and change the event names and categories to be more meaningful.
- No lookup lists are created by the configuration tool. It is useful to make lookup lists to translate integer values for analog event values and shift numbers into string values. String values are more useful in both reports and in Report Expert parameters. You can also make lookup lists for machine states.
- Each workcell is disabled and you must enable it manually.
- If you have chosen to disable events in the configuration tool, you must manually enable all the events that you want FactoryTalk Metrics to use. You must do this for all workcells, not just the workcells you have selected in the configuration tool.
- You may add performance parameters that use data points that are not contained in the UDT, such as additional events.

The following performance parameters are not configured by the FactoryTalk Metrics Configuration Tool, and must be configured manually:

- Scheduled Availability using Time Patterns - an alternative to collecting shift information from the control system
- Machine States - required to use some of the standard reports provided with Report Expert
- Event severity
- Lookup lists
- Event value - choose the Beginning or Ending value.
- Fault Metrics

NOTE: If you run the FactoryTalk Metrics Configuration Tool again, all of your changes made in the Configuration Console to the imported performance parameters will be lost.

Advanced reporting topics

Configure reports

FactoryTalk Metrics contains over 40 configured reports in the Report Expert environment. However, customers require additional reports that are not provided. The *Report Expert User Guide* contains instructions on how to create and manage parameter sets and the Report Explorer to extend the standard Report Expert report templates. To see a list of standard Report Expert report templates, refer to the *Report Expert User Guide*.

You can use the following options to create additional reports:

- **SQL Server Reporting Services (SSRS).** This custom report feature is provided with Microsoft SQL Server. Report Builder is easy to use, but has limited functionality. Business Intelligence Development Studio offers more functionality, but requires more technical knowledge. Reports that are deployed to SSRS can be added to and viewed in Report Expert.
- **Third-Party Reporting Tools.** You can use third-party reporting tools to report on data in the FactoryTalk Metrics database.

Icon definitions

In this chapter, you will learn about the following:

- [Plant model icons on page 108](#)
- [Performance parameter icons on page 109](#)

Plant model icons

Tree views in the **Manage Performance Parameters** and **Configure Performance Parameters** dialog boxes display the state of plant model elements.

The following table lists the plant model element icons.

Icon	Plant model element
	Enterprise.
	Site.
	Area.
	Line.
	Workcell.
	Custom Activity Area.
	Equipment Resource (configured only by the FactoryTalk Scheduler Client).
	Labor Resource (configured only by the FactoryTalk Scheduler Client).
	Standard Resource (configured only by the FactoryTalk Scheduler Client).

The following table lists the state icons that are applied to the plant model element icons to define their states.

Icon	State definition
	The plant model element has performance parameters configured but is not enabled. The status of the plant model element is "Configured."
	The plant model element has performance parameters configured and is enabled, but it is not collecting data. The status of the plant model element is "Configured".
	The plant model element has performance parameters configured and is waiting to receive initial data values. The status of the plant model element is "Starting".
	The plant model element has performance parameters configured and is waiting to receive initial data values. The status of the plant model element is "Running".

Performance parameter icons

The **Categories & Events** tree view on the **Configure Performance Parameters** dialog box shows the state of performance parameter events and categories.

The following table lists the performance parameter event icons.

Icon	Event or category
	System-generated event.
	System-generated event category.
	User-defined event.
	User-defined event category.

The following table lists the state icons that are applied to the performance parameter event icons to define their states.

Icon	State Definition
	An event that is enabled or an event category that contains enabled events. These events are not collecting data.
	An event that is waiting to receive initial data values or an event category that contains events that is waiting to receive initial data values.
	An event that is collecting data or an event category that contains events that is collecting data.

Report data sources

FactoryTalk Metrics exposes the following important report data sources from which report designers can create charts and tables:

- [Workcell history on page 110.](#)
- [Event history on page 111.](#)
- [Machine state data on page 111.](#)

In order to create charts and tables effectively, you need to understand first the types of data included in these report data sources.

Workcell history

The PlantMetrics Workcell History report data source is based on the **OEEQWorkcell** view in the RSBizWare database. This report data source contains the historical performance data for activity areas, including OEE performance and the data that is used to calculate OEE performance. Each record contains summarized information for a single enabled activity area collected within a specified period. Each record includes:

- The start and end times for the record.
- The number of parts built (good parts, scrap parts, and total parts).
- The amount of time the activity area was available, scheduled available, and running.
- The number of the part being built and the ideal cycle time for that part number.
- The number of parts that could have been built under ideal conditions.
- Shift information.
- The OEE calculation for that period.
- The value for each configured user-defined summarization criterion.

Records will be created as long as FactoryTalk Metrics is collecting data—24 hours a day, 7 days a week, whether the monitored equipment is running or not. The **Performance Data Trending Rate** interval selected for an activity area specifies the duration of the Workcell History record. The current record is updated every 10 seconds with new performance information. When the Performance Data Trending Rate interval has passed, the current record is closed and a new record is created. The current Workcell History record will also be closed and a new one will be created if any of the following occurs:

- The scheduled shift changes.
- The Scheduled Availability status for the activity area changes.
- The number of the part that the activity area is building changes.
- The value of a configured user-defined summarization criterion changes.
- The ideal cycle time changes.
- Data collection stops (a new record is not created).

Since there is one record in the database for each activity area for each Performance Data Trending Rate interval, it is not possible to report on periods of time less than the specified rate. For example, if the Performance Data Trending Rate for the activity area is set to 10 minutes and you try to report on Workcell History data between 12:00 and 12:05, you will get data between 12:00 and 12:10.

Event history

The Event History report data source is based on the OEEQEvent view in the RSBizWare database. This report data source contains the historical data of individual events that have occurred at the activity areas that are being monitored by FactoryTalk Metrics. An Event History record is created when an event occurs, and is closed when that event ends. FactoryTalk Metrics uses Event History records to compute the performance information that is stored in the PlantMetrics Workcell History report data source. Each record may include:

- Activity area information.
- Shift information.
- The number of the part being built.
- Start and end times for the record, along with the duration of the record.
- Event description and event folder information.
- Start and/or end values collected along with the event. (This may include the difference between start and end values. If the event value has a lookup list, the appropriate text from the list will be stored in the record.)
- Whether the event is user-defined or system-defined.
- A fault indicator, which indicates the first record of a new event. This is useful if multiple records are created for a single event.
- Severity level.
- The value for each configured user-defined summarization criterion.

All Event History records are subject to event data summarization, which is a process in which a single event can be split into multiple Event History records according to various summarization criteria. Event data summarization preserves the ability to generate event reports by shift or by part number. System-generated events are summarized (the current Event History record is closed and a new record is created in the database) based on the event data summarization type that is specified.

Unlike Workcell History records, Event History records are not created on a regular, predictable basis and can span any amount of time. An Event History record is created when an event occurs and is closed when that event ends, which in some cases may be hours later. Even though the time span of an Event History record can be long, its contents are updated every 10 seconds. Because Event records can have different time spans, reporting on Event records can bring some unexpected results. Remember that reports always include entire records, and cannot be run on portions of records. You can mitigate this effect by ensuring that user-defined events have similar data summarization types. Refer to the Configuration Console online help for detailed information on events and event data summarization types.

NOTE: In FactoryTalk Metrics, you can disable event data summarization for a user-defined event. Use this feature with caution though, because it could result in creating event records that are difficult to report on.

Machine state data

The FactoryTalk Metrics Machine State Data report data source is based on the OEEQStateData view in the RSBizWare database. This report data source contains historical machine state data. Each record contains the following summarized information for a single occurrence of a machine state for a configured workcell:

- Activity area information.
- Machine state ID and description.

- Start and end times for the record, along with the duration of the record.
- Shift information.
- The number of the part being built and the ideal cycle time for that part number.
- The number of parts built (good parts, scrap parts, and total parts).
- The value for each configured user-defined summarization criterion.

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Includes the name of the open source component, its version number, and the type of license.
- **Copyright Text**
Includes the name of the open source component, its version number, and the copyright declaration.
- **Licenses**
Includes the name of the license, the list of open source components citing the license, and the terms of the license.

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`C:\Program Files (x86)\Rockwell Software\RSBizWare\Release Notes\OPENSOURCE\oss_licenses.txt`.

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Rockwell Automation Support

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Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
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Waste Electrical and Electronic Equipment (WEEE)



At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at rok.auto/pec.

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